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GAS STOVES.

The season has fully arrived when the utmost energy of the gas manager should be exerted to push the introduction of gas stoves. This should be done, first, for the public good, the public health, and the public welfare of all.

We are fully aware that gas companies are not primarily organized and operated as charitable institutions, although the results flowing from the carrying on of a well-conducted gas company have probably been, in the aggregate, more beneficial, more conducive to health and happiness than those from almost any other manufacture; and, hence, the real blessings that should flow from institutions founded solely for public good have resulted perhaps more efficiently and surely from the sale of good gas than from the high sounding institutions whose multitude of sins are hidden beneath the "charity" emblazoned over their doors.

The prime purpose of any business investment is to secure a sure and adequate return for the capital invested, and this is the plain business basis upon which all gas companies should be managed; and, if properly managed, nothing but good can come to the community which they serve. The advantages resulting from the use of properly constructed gas cookers are so numerous and, to gas makers, so well known, that it would seem almost superfluous to mention them, if it were not to call to the minds of directors and managers the fact that the vast bulk of the people know really but little about it. They may be slow to learn, but when once they have learned they are slow to forget that the information thus acquired has proven a source of benefit.

As the extreme hot weather approaches it goes without saying that the most opportune time in the year is reached to secure the placing of cooking apparatus to be operated by gas. The economy is much more apparent in summer than in winter. The smaller amount of heat demanded favors the employment of an agent that can be perfectly controlled and instantly cut off when not needed. There is no well-informed manager but that can easily show, to one interested enough to listen, how manifold are the benefits of gas over coal in warm weather—and the way to arouse a spirit of enquiry is simply to advertise. There is no good reason why the gas company should not make fully as much use of the advertising columns of its *local papers* as any other business of equal magnitude; and while circulars and notices are excellent in their way, they cannot be compared to the constant daily appearance of an advertisement in the newspaper which every one reads, and which cannot be taken up without attracting attention to a well-arranged, prominent advertisement put in the proper place and kept there.

We say, now is the season to push this matter to the utmost extent. If a consumer once begins the use of gas for cooking he will soon find out for himself its blessings, and he becomes a permanent user and advocate; and the result is a proper employment of the distributing plant during the daytime, which rapidly decreases the cost of delivery, and will inevitably enable the manager to reduce his price of gas as the send out goes up What is wanted to make the capital more remunerative, and thus cause a reduction of cost to the consumer, is a constant occupation for the plant in which the capital is invested. If the day consumption can be made equal to the night consumption the expense of maintaining idle plant would disappear, and the manufacture would be much more uniform.

One of the principal obstacles to the more general introduction of gas stoves for cooking purposes has been the first cost. In a great measure this obstacle has now been overcome; but it would seem that much greater advances in this direction are possible. There is no reason why a perfect gas cooker should cost any more than a perfect kitchen range; and it is in the pursuit of this that the energies of our inventive talent should be devoted. Reduce the first cost of stoves to as low a figure as is consistent with the employment of sound constructing principles, excellent material, and competent workmanship, and success is assured.

It is a well-established fact that the successful employment of gas as a cooking and heating agent is no longer problematical; and all that now remains for the intelligent gas maker is to foster and develop the sale of his product for these purposes. Consumers should be carefully and patiently

shown the advantages which would accrue to them from its use—the surety, safety, ease, comfort and cheapness of this reliable agent as a substitute for coal in the ordinary or extraordinary culinary operations of the kitchen. Let the consumer be once assured that he is to benefit by the new order of things and half the job will be accomplished.

Our Western friends appear to have taken the lead in this matter, and the rapid strides which have already been made promise immense results for the future. It is to be sincerely hoped that the next meeting of the American Gas Light Association will see this topic fully and exhaustively presented before it for the consideration and discussion which its importance deserves.

MEETING OF THE GAS INSTITUTE.

The Nineteenth Annual General Meeting of the members of the Institute was held on Tuesday, Wednesday, Thursday, and Friday, the 13th, 14th, 15th, and 16th of June, 1882, at the Institution of Civil Engineers, 25 Great George street, Westminster, S. W., with the President, George Wilson Stevenson, M.I.C.E., in the Chair. The meeting was in all respects a grand success; and its results prove the wisdom of the steps taken in the new direction a year ago. We will publish a detailed account of the proceedings in our subsequent numbers.

Obituary.

Mr. James Blackburn.

Death has claimed another prominent English Gas Engineer as his own. The London *Journal* contains the following concerning the demise of Mr. James Blackburn, C.E., of Weston-super-Mare:

"It is with much regret that we have to announce the death, on the 23rd of May, at Weston-super-Mare, of Mr. James Blackburn, C.E., who for many years past has honorably and successfully occupied the important position of Engineer and Manager of the Oriental Gas Company's works at Calcutta. Mr. Blackburn's health most unexpectedly gave way towards the close of last year; and he was obliged to leave India recently and return to England, but in the full anticipation of resuming his duties, in restored health, after a few months' stay at home. His strength, however, was not sufficient to combat the liver complaint by which he was attacked and he gradually sank.

His loss will be severely felt by the Company he served so well, and by those who were intimately associated with him; also by a large circle of friends, both here and in India, who esteemed and respected him for his high character and amiable disposition. His valuable labors in connection with the formation and early proceedings of the British Association of Gas Managers—of which body he was several years Secretary—are well known to many of its members; and much of the success which attended the first few gatherings of the Association may be put to his credit.

Newspaper "Hindsight."

The London *Journal of Gas Lighting* deals thus tenderly with the "moulders of public opinion," on the other side of the water.

There are many indications that the principal daily newspapers are awaking to the dangerous character of the Stock Exchange craze for which they helped to prepare the public mind. For several months past all these publications have given free and bold advertisement to any vaporer calling himself an electrician, until the community has become surfeited with the babble of the Ruthrauffs and like men of the present time. Now, however, the reaction having begun, the same organs of opinion are executing the strategetic movement commonly known as "hedging"; probably with the view of enabling themselves, in the impending crash, to disclaim all share in the scandal.

Thus in yesterday's *Daily News* there is a special article on "Light Supply," which, if it had appeared a month earlier, or at a time when the same journal was disseminating false intelligence concerning the Godalming experiment, might have done some service. We are herein told that nothing is known about the cost or practicability of electric lighting for general purposes; that gas lighting is eminently improvable; that Mr. Lane-Fox's statements are open to doubt; and that speculation in electric light shares is a mania.

All this is very true; but it was equally true a month or more ago, and by giving it publicity now and withholding it then, the newspaper in question is made liable to the reproach of not speaking the word in season. It is the same all round the Press. There is no lack of warnings now that the public have begun to warn themselves; but before this movement began few of the newspapers would have found room even for corrections of the most flagrant misrepresentations on the part of electricians. In this, as in many other respects, the influential newspapers which arrogate to themselves the reputation of leading the opinions of a community seem to follow rather than lead.

The Electric Age.

We are somewhat comforted in our despair, now that we are no longer condemned to pass into absolute nothingness without the company which misery is supposed to so dearly prize. The genius of electricity, not satisfied with the wonderful triumphs thus far achieved in the domain of artificial lighting, aspires to greater things; and, through the medium of its heralds, boldly proclaims to the world that the age of steam is almost, if not entirely, ended. It is sad to thus see our old friends stricken down by the hand of this remorseless young giant—sadder still to think that their day of usefulness is ended.

Speaking in all seriousness—is it not time that such "bosh," as the following from *The Electrician*, should cease. There is just one grain of sense in the whole thing, and the *grain* is stowed away in the last four words. To our minds there is not the slightest doubt but that electricity will give new *outlets* for capital—outlets long, wide and deep.

"The accumulated capital of Europe is seeking 'fresh fields and pastures new.' There is a redundancy of money in the great financial centers, an overstocked labor market—as evinced by the enormous immigration here, and by the social uneasiness that in some shape or another is to be seen in almost every European country. How to find employment for these vast savings, and how to find work for the great army of idle hands, is becoming a serious problem. There has been an enormous increase of population in Europe. Small cities have become immense hives, containing populations that would formerly suffice for an entire state; some countries, like England have doubled their population within half a century; others, like Belgium, have attained a limit which was never dreamed of by even the most decided of anti-Malthusians. Machinery, on the other hand, has increased production to such a degree that only a vast foreign demand can either justify or sustain it.

"But there has been another cause, the importance of which is certainly least of all appreciated here. The railway age is, so far as Europe is concerned, almost over. Much remains to be done, certainly; new countries will require roads, but the vast work of reconstructing the transport ways of the great commercial countries, which began in 1847–48, is now over, like 'the glorious days of Aranjuez.'

"The immense works which were necessary in adapting steam to every industry have been in great part finished. Chemistry and other sciences are tending more to save labor and capital now employed, than to find any new uses for them. At the same time the economized earnings of the nation are continually growing. Savings banks are loaded; ordinary banks will give little or no interest. Governments are endeavoring to fund their debts at lower rates of interest, and that very interesting class that live on 'the interest of their money' are greatly worried in mind, for they are suspicious of 'furriners,' and dreadfully afraid of Mexicans, Egyptians and Turks, gentlemen who can be depended upon for one thing—not to pay their debts. States, too, are buying up all the great railway lines, and gas shares are regarded with distrust.

"In this crisis, electricity comes in to take the place of steam. As light it will not only replace gas over the world, thus involving an immense but remunerative outlay of capital, but will, as an illuminating power, be used where gas never would be. As a motive power, and the force that cleaves the rocks and girdles the earth in a few moments, it is the greatest; it will supplant steam in many ways. It will draw trains and coal and ore from the mines, and separate the pure ore from the dross; it will propel vessels that, perhaps, will be no longer known as steamers; it will run our factories and act as timekeeper and as faithful overseer, showing the error of a grain of overweight in the delicate thread; it will give the warning of fire in buildings, and put it out at the same time; it will necessitate an immense reconstruction of machinery and method in every industry and every art. It will turn night into day in more senses and ways than one. The inventive power and genius of the world is now being turned to it, for it alone, of all agents, can be utilized in every manifestation of human labor.

"The steam age is ending; but the world, everlastingly and eternally youthful, in contradistinction to human empires, knows no degeneration; neither does human civilization. We have had an iron age, we are now entering on a golden one. Electricity will give new prospects for progress, new outlets for capital."

Laws of the Solubility of Carbonic Acid in Water under High Pressures.—The temperature remaining constant, the coefficient of saturation (*i.e.*, the quantity of gas measured in c.c. at zero and under the pressure of one atmosphere), dissolved in 1 c.c. of water, increases much less rapidly than the pressure, and tends toward a certain limit.

If the pressure remains constant, this coefficient augments as the temperature diminishes.—*Comptes Rendus.*

[Official Report.—Continued from p. 269, Vol. XXXVI.]

Fifth Annual Meeting of the Western Gas Association.

Held at the Grand Pacific Hotel, Chicago, Ills., May 10, 11 and 12.

Captain W. H. White made the following remarks:

Mr. President—I am very glad to enjoy the pleasure of meeting and conversing with my brethren of the Western Gas Association. If I were asked to tell why I have journeyed so far to attend this meeting, it would be impossible for me to return a satisfactory answer, for I am not aware that I have any well defined object in view. But nevertheless, here I am, and I am happy to state that I have no cause to regret my coming. Before starting I took the precaution of looking up Brother Goodwin, and have brought him along to help do the talking. When the proper time arrives, he will be found competent to perform his share of the task.

But to get back to the stove question. My experience has taught me that it is the hardest thing in the world to make gas men believe that gas stoves really amount to anything. One would suppose that there must be an antagonism existing between them. When the official recieves a stove for the purpose of exhibition, he generally stows it away in the dampest and most obscure corner of his office, allows rust and mould to accumulate upon it until it becomes almost unrecognizable, and then calmly points to it with a finger of pride and tells his consumer that it is an elegant thing—that he ought to have one in his house. And yet in ninety-nine cases out of a hundred those who are most concerned in the introduction and extended sales of stoves—viz., gas manufacturers—have never even thought it worth their while to have them put up in their own residences. But they are always ready to sell the article to somebody else. When one wishes to dispose of any commodity of that nature, he should first understand it—become fully possessed of its merits from actual experience; and he will then be in a position to tell others all about it.

Some years ago I took a gas stove home, but found its introduction strenuously opposed by the cook, she doubtless reasoning that if so convenient an article was brought into the household her services would no longer be regarded as indispensable. This difficulty overcome, the stove was given a thorough trial, and, it is almost needless to add, proved an unequivocal success; it performed to the satisfaction of everybody, the cook especially.

When a consumer is making inquiries in regard to the purchase of a gas stove, I always find that one of the first questions asked is, "Have you ever tried one of them?" And if you can answer that you have, you very seldom have any trouble in making a sale.

In conclusion, permit me to say again that I am very thankful to have been given this opportunity of meeting my brother associates of the West. As most of you are doubtless aware, the American Association is to assemble at Pittsburgh next October, and I hope that as many of you as can possibly do so will meet with us at that place. We have every reason to expect a large and pleasant gathering, and I certainly should be glad to have the pleasure of extending you a friendly welcome, one and all.

In answer to a call made upon Mr. Goodwin, of Philadelphia, that gentleman arose and spoke as follows:

Mr. President:—Engaged as I am in the manufacture of gas stoves, it is always with considerable diffidence that I speak upon that particular subject It is a difficult matter to keep from introducing "business" into these conversations; but in anything I may say, I trust the gentlemen present will understand that I am not speaking of goods which *we* manufacture to the exclusion of those made by others who are similarly employed as ourselves.

There are various opinions as to the best forms, but that the gas stove, in some shape, is a desirable thing for gas companies to introduce among their consumers everybody admits. Stoves of different patterns have been subjected by me to many and prolonged tests. The results of some of these trials have already been published. I have also made some calculations as to what advantage it would be to gas companies to bring into use as many stoves as possible; and it is easy enough to see that it is a matter well worthy of their attention.

As to the economy of cooking with gas as compared with coal or coke, I am confident that the former is much the cheaper. In a number of tests made some time ago, I found by a careful comparison that the difference in favor of gas was 46 per cent. Similar experiments made at the London Hospital, where all their meats are cooked upon large gas ranges, tend still further to demonstrate the correctness of my assertions.

And now let me say a few words with reference to gas engines. I went to Europe last year to attend the electrical exhibition, having commenced the study of that science years ago in connection with my friend Moran, who probably has not forgotten the startling success which attended one of my early experiments, and in which he figured as the unfortunate victim. I saw the electric light in all its forms, shapes, and sizes, from the 12 up to what was called the 20,000-candle power light; and I will say right here that gas engines were employed quite as much if not more than steam engines for furnishing the power to supply those lights. I counted in one room sixteen gas engines, ranging in size from 10 to 50-horse power. They worked with all the precision and steadiness possible in any motor; and it was a grand sight—one worth traveling a long distance to witness. In connection with the electric light, I would say that, in company with a gentleman largely interested in gas matters, I was called upon recently to go to New York to make some tests of its illuminating power and cost. In the place we visited there were 75 Edison incandescent lamps in use. Calculating by the usual formula employed in such cases, we found that the engine used to keep these lamps burning would ordinarily be rated at about 74-horse power. As I before observed, there were 75 lamps, each giving a light equal to sixteen candles. And yet they tell us that this is cheaper than gas!

But to return to the question of gas engines. I investigated that subject pretty thoroughly while in Europe, and, to be brief, I will say that in company with a few other gentlemen I have secured an engine which is to be brought to this country on trial. It has a six-inch cylinder, with a twelve-inch stroke, and develops 9-horse power as against the 4-horse power developed by the engines of the same size which are now being so largely used in this country. The terms on which that engine has been procured are as follows: It is to be delivered in Philadelphia, and will then be submitted to a thorough examination by a committee of experts. All questions are to be answered to our satisfaction, and if it performs as is claimed for it, you will in a very short time have another gas engine on the market.

Mr. Starr—As regards the introduction of stoves, I believe with Mr. White that one of the great drawbacks to success lies in the failure of gas officials generally to put them up in their own houses. And, another thing, too many of the smaller sizes are being used. Our town, I might say, is just full of them, and I am trying to have them exchanged, as rapidly as possible, for the larger ones. Consumers have acquired a habit of looking upon a gas stove as an article not adapted for general cooking purposes, but as something to be used only occasionally, for making the evening tea or heating a little water now and then. Efforts should be made to get the large stoves and ranges introduced for daily use, and also the parlor heaters. If you can once get a stove set up in a house you are sure to sell it. I often say to a consumer, "I will put up a stove for you, and if, after a fair trial, you are not entirely satisfied with it, it shall be removed and not cost you a cent." I have disposed of many in this way, and I do not remember ever having had to take one back. Within the next two or three years I expect to sell more gas for cooking and heating purposes than for light.

Mr. Dunbar—Do you use separate meters for the stoves?

Mr. Starr—I never have except in one instance. Sometime ago I sold a stove to a consumer who was already using a large amount of gas for illuminating purposes, and I knew that if an unusually large bill should immediately follow upon his first month's experience with a stove, he would naturally attribute it to that cause. So in his particular case I had a separate meter set. The result must have been entirely satisfactory to him, for he told me several months afterward that he found gas to be the cheapest as well as the best fuel he had ever used.

Permit me to say right here that I am an earnest advocate of cheap gas. I have reduced the price in Richmond to $2 per thousand, and last year our sales increased 25 per cent. in consequence; "and still the good work goes on." We have one gas engine at work which is paying us about $20 per month. Its owners are well satisfied with it. At first it gave us a great deal of trouble, simply because we did not understand it. We were finally obliged to send for a man to come on and show us how to clean it; and since then it has given us no trouble whatever. That was the only fault the purchasers had to find with the machine—it would not clean itself. I could have sold another engine a few days ago, but found upon inquiry that it would be impossible to get an order filled in less than four months; so I was unsuccessful in effecting the sale, as my customer could not wait that long.

Mr. Stein—Speaking from the standpoint of a consumer, I desire to say that, with reference to the economical advantages of a gas stove, there is one consideration that seems to have been overlooked. That these stoves are really economical when judiciously used I have no doubt. But their management is too frequently intrusted to servants, who through ignorance or carelessness make them a very expensive luxury. This, in my opinion, has been one of the main reasons for preventing them from making such rapid strides in public favor as they naturally should. It devolves upon the ladies of the household to inaugurate a radical reform in this respect, and when that is done gas stoves can successfully compete with any others in economy, as in all other respects.

Mr. Carter (Princeton, Ills.)—It my not be out of place to say here that if the same effort were made by gas stove manufacturers to place their wares before the public as is exerted by the dealers in oil stoves, it would be an easy matter to get consumers to purchase them. Let the large manufacturers establish agencies throughout the country, or intrust the sale of their

stoves to the proper parties, and success is certain to crown their efforts. Superintendents of gas companies do not always have the time or the inclination to act as agents for the sale of gas stoves.

Mr. Goodwin—I would like to make one more remark to explain why it is that gas stove manufacturers do not go directly to the consumers in the same way that the oil stove agents do. The oil stove is a much smaller and cheaper affair than the gas stove. Our aim has invariably been to construct stoves to meet the wants of a large family, and to put them on the market at such prices as will enable us to sell them. In order to do this we must dispose of them at a profit so small that if I were to tell you what it is you might not credit my statement. Therefore we cannot afford to go directly to the consumer nor to employ agents, and are obliged to depend for assistance from gas companies themselves.

The President formally closed the discussion on the above subject, and placed the last topic on the programme before the Association:

THE ELECTRIC LIGHT—WHAT EFFECT HAS IT HAD ON THE GENERAL CONSUMPTION OF GAS?

Mr. Dunbar—I think our friend Burtis has kept quiet altogether too long, and I would like to hear what he has to say on this subject.

Mr. Burtis—I hardly believe that there can be a gentleman in the room who does not know as much about this subject as I do. I can state that there are a number of electric lights in use at various places in this city, but so far as I have been able to ascertain, there is no one who claims any saving from their employment. From all I can learn, I am satisfied that they are used solely for advertising purposes, and not on the ground of economy. There is one party here running a large restaurant who has in one part of his establishment five or six electric lights. I was there to-day and had my lunch, and I noticed that he had perhaps a dozen gas jets burning. I asked him how it happened that he was not using his electric light in place of gas. He said, "Oh, I only use the electric light in the evening." I have asked the same question frequently, and find always that the light is used in the evening only, and simply as an advertisement. So far as our business is concerned, we care nothing about the electric light; it has not affected us at all. Gas bills are no less than they were before its introduction, and we are not alarmed as to the future.

The Secretary—Somebody was kind enough to send me a paper a few days since with a marked article contained therein headed "The Doom of Gas." It is an account of an interview with Edison, and there are one or two points to which I want to call the attention of the Association. The first one is for the benefit of the water gas men. The question was asked, "Is water gas as deleterious as coal gas?" His answer was, "Much more so, owing to the larger proportion of carbonic oxide—which is an active blood poison—contained in it. I would just as lief have sewer gas come into my room as water gas."

The next is for the benefit of the balance of you:

"What do you think of the gas people generally?"

"I have a very poor opinion of the men generally engaged in the gas business. Like all large corporations making heavy profits, any mismanagement is never inquired into as long as the company pays fat dividends; and of all corporations in the United States, the gas companies are those most grossly mismanaged. For years they have been squeezing the public as they would a lemon."

"But if the electric light is such an invincible foe of gas, why haven't they bought it up?"

"They never thought the thing could be done; and having so much interest in not having it done, they would not reason or listen to anything tending to show that it could be accomplished. And besides, they could never buy up our company, anyway."

Mr. Littleton—I would like to hear from some gentleman as to the result of the introduction of the electric light for street lighting purposes in the smaller cities of the West. Has it been successful or not? Has its use been attended with economy to the city, or is it a more expensive light for street illumination than gas? Mr. Smith, of Grand Rapids, has had some experience in this direction, I believe. Will he please favor us with what information he has been able to obtain on the subject?

Mr. Smith—I may say that in Grand Rapids we have about 30 electric lights, 11 of which are used for street lighting, and for which the city pays. These lights cost about $240 each per year; so you can readily see that no economy can attend their use. The 11 lights illuminate only a small portion of the city; for the rest gas is used, and is likely to continue in use for some time to come. As regards the effect the introduction of the light has had upon the gas interests of our place, I can say that it has been rather beneficial than otherwise. During the last twelve months we have sold more gas than in any previous year. When these much talked of Brush lights were first being put up, we supposed we might as well close the works and retire from business; but the result has proved quite the contrary. I have noticed in a number of newspapers the statement that Grand Rapids has enjoyed the distinction of being the first city in the United States to adopt the electric light for street illumination, and that our citizens had no further use for gas. From the remarks I have already made you will see that this statement is hardly borne out by the result of my observations. Quite a number of our consumers who tried the light when it was first introduced have recently discarded it, and now pay their gas bills with unfailing regularity. In addition, they invariably want larger pipes and bigger burners, and are consequently more liberal users of gas than they ever were before.

Mr. Goodwin—Let me say a few words with reference to the use of large gas burners as successful rivals of the electric light in point of power. A short time ago the president of the Detroit Gas Light Company rather ridiculed this large burner system which is so rapidly attaining a state of perfect development; but upon having the matter satisfactorily demonstrated to him, he concluded to try a 200-candle power burner as an experiment. He used it for two nights, and then telegraphed for one of 1,000-candle power. This, however, we could not at once supply; so he took the largest we had—one of 400 candles. In comparing the power and effect of these large burners with the electric light, the superiority of the former was so manifest that the citizens are very desirous of having a number of them erected for lighting the streets.

Mr. Smedberg—I have heard from electricians that in computing the candle power of their light they multiply its power, as ordinarily estimated, by four, since the light shines out to the four quarters of the compass. That is the reason why the intensity of the light has been so absurdly overrated. Ridiculous as this statement may appear, it has been told me by high authority, and is doubtless the fact.

The President—I have been informed that the city of Paris is only paying for 63 electric lights at the present time. Is anyone acquainted with the facts in the case?

Mr. Burtis—With reference to the question just asked, I would say that I believe the statement to be true, unless some changes have been made lately of which I am uninformed. I visited Paris in 1878, and of course saw the electric light as exhibited at that time; but quite recently I have been told by a gentleman who is well informed on the subject that a short time ago a proposition was made by one of the companies to light some of the streets, but the price demanded was so high that the city refused to enter into a contract on the terms proposed. The electric light company, at last accounts, was endeavoring to get the city to renew the old contract for the lamps already in use—sixty-three in number—but with what success I have not learned.

Mr. Starr—I have been an interested observer of the progress of the electric light within the past year or two, and have of course read more or less about it. I noticed recently that the contract for lighting a certain number of lamps in the city of New York is soon to expire, and that the company which had been supplying them for 33⅓ cents each per night now asks 70 cents for the same service. The city has not only declined to accept the proposition, but has even refused to extend the contract on the old terms. While in New York last winter I happened to meet one of the employees of the electric light company, and was informed by him that when the lamps burned all night, four carbons, costing 7 cents each, were required. There could not have been much profit in the contract when but 33⅓ cents was received and 28 cents of that amount was paid out for carbons alone. The fact that the city of New York refuses to enter into a new contract at the price I have named, shows as conclusively as anything can that there is not much encouragement for capitalists to invest their money in electric light stock. In our town (Richmond) there are three arc lights in use at the depot that have been put up recently. The lowest price asked so far is $15 each per month, but as a rule the company does not expect to furnish them for less than $20. The president of one of the railway lines centering at Richmond told me that $20 per month was paid for each of the lamps in use at the Indianapolis depot. Allowing the same price per lamp for those in use at our place, the expense to the railway company will be $720 per annum, as compared with $200, which is about what they have been paying for gas.

The Secretary—I want to read something more from the report of this interview with Edison. He was asked the question:

"Why have your lights been removed from the Vanderbilt residence?

"It is false," Mr. Edison replied; "he never tried our light. We have wired his house for lighting it from our station in the way of general distribution; but he thought he would rather not wait until we started, and preferred an isolated plant for himself. The first night the engine was set to running it made a noise, as all new engines will, and Mrs. Vanderbilt complained—and that settled it."

"How about the alleged setting fire to the woodwork?"

"There is nothing in it except just this: In running temporary wires in different directions, just to show the effect, one of them came in contact with a burglar alarm wire, and this becoming overheated, charred some of the gold threads of the wall paper; that is all."

The questioner now turned to the main purpose of the interview—the cheapness of the incandescent light:

"The best answer to that question is that we are going to sell the light as cheaply as gas. There are 16,000 gas jets in the first district which we shall commence lighting up in a couple of months, and we have arranged to supplant all these 16,000 jets (with the exception of 850) with our lamps. We have got written agreements with 93 per cent. of the gas consumers in this district that they will take the light, provided it is furnished at a price not to exceed what they have been paying for gas."

"And who is to decide what their gas bills have been in the past? Have you seen them?"

"Yes; we have taken copies of them all. We have 24 books containing these records."

"What will be your investment, per thousand feet of gas, in the electric light plant?"

"Ah!" exclaimed Edison, "that is coming home pretty closely. After a little reflection he added, "Well, I'll tell you; our investment will be $3.75 per thousand feet."

"And what is the investment required for gas?"

Edison, who appeared to have the figures at his fingers' ends, replied, "$5.75 per thousand feet."

"Do you include in these figures everything except running expenses and the depreciation of the plant?"

"Certainly. My real estate investment is smaller than that of gas companies. We can have our stations in the back slums, and don't need so much room. I can put up all my works to light the city of New York inside of the gasometers of the Manhattan Gas Company. Our pipes underground are surrounded with an insulating material, and will last for fifty years, while gas pipes rust to pieces in twenty. The depreciation in our dynamos is not over 1 per cent. per annum."

"Do you know precisely what it costs the companies to make gas?"

"Precisely. I have gathered the statistics for years past. In New York the gas in the holder costs 45 cents per thousand feet, and the expense of distribution, collections, legal and other items, makes up 45 cents more; so that it costs 90 cents altogether. And for this the consumer pays $2.25."

"In saying that gas costs 45 cents in the holder, do you allow for the companies' receipts from the sales of coke, tar, and ammoniacal liquors?"

"I allow for every cent realized in that way. No money can be made in selling gas for 90 cents a thousand—not a cent."

"Supposing the companies put the price of gas down to $1 per thousand, just to crush you—what then?"

"I'll tell you what my ideas are," replied Edison, with great energy. "We are not going to charge less than $1.50 for our light equivalent to one thousand feet of gas, even if they put it down to $1. Electric light is commercially worth 50 cents more than gas, because it is a better, clearer, purer, and more wholesome light, giving out almost no heat."

"You might, then, have to compete at $1.50 as against their 90 cent rate?"

"Oh, no; gas only costs the manufacturers 90 cents with their present custom at their present output. At $1.50 I should certainly take away one-half of their consumers; and when I have reduced their business to that extent, I have carefully figured out that their gas will cost them $1.28 per thousand."

"But the gas companies are rich."

"No, they are not," Edison interrupted. "They have paid out all their gains in big dividends. They haven't accumulated any large surplus."

"In any case, supposing they put down the price of gas lower still—what then?"

"I can say right here that even if they reduce it to one cent. per thousand we shall not charge less than $1.50; for our light is so far superior that we should get a large number of their consumers any way; and besides, gas companies are not so anxious to bankrupt themselves within a few years. They'll look out fast enough for number one."

Mr. Carter—I would like to ascertain, if I can, what it costs to produce and maintain the electric light. If anyone present can inform me, I would like to hear from him.

The President—I do not believe the electric light men themselves could answer that question.

Mr. Munzinger—I would say as to that, that as yet it is impossible for anyone to tell what it costs. Among other items of expense which have not yet been satisfactorily determined is that of running their steam engines. The claim is made for some engines that they can be maintained on a consumption of coal of two or three pounds per horse power per hour; but on an average it will be found in practice that nearer seven pounds is required, and where small engines are used the expense is greater in proportion to the power derived than when those of a large class are employed. In addition to this there are a number of elements in the problem which go to swell the expense, and whose cost has so far been hardly approximated.

The Association here adjourned until 9 A.M. Friday, May 12.

MORNING SESSION.—THIRD DAY—MAY 12.

The Association was called to order at 9 o'clock.

The President appointed a committee, consisting of Messrs. Fullager, Dunbar, and Barrett, to make the necessary arrangements, at the proper time, for the next annual meeting, to be held at Cincinnati.

After appointing A. W. Littleton as marshal for the day, the Association formally adjourned, to meet in Cincinnati on the second Wednesday in May, 1883.

Immediately after adjournment, the members generally availed themselves of the invitation to visit the pipe mills of the Crane Brothers Manufacturing Company. Carriages were promptly in readiness, and the large party was soon transferred to the West Side, en route to the factory. Arriving there, the members were courteously received by Mr. Crane and a corps of assistants, and every facility was afforded the guests for observing in detail the process by which the metal in the rough is transformed, as if by magic, into wrought iron pipes varying in size from one-eighth of an inch to ten inches in diameter. Everything within this mammoth establishment moved with the smoothness and precision of clockwork, and the sight was as instructive as it was novel to the many who had never enjoyed an opportunity of witnessing pipe making on so large and systematic a scale. The only drawback to the pleasure of the visit lay in the fact that the time allotted was found altogether too short, many having to depart with a portion of their curiosity still ungratified.

The trip to Pullman was next in order, and, in spite of the most execrable weather which even Chicago can occasionally impose upon the suffering stranger, an undaunted party of forty or fifty members of the Association took the two o'clock train on the I. C. R. R., and after a pleasant ride of 14 miles down along the shore of Lake Michigan, found themselves in one of the most phenomenal little cities which this or any other country has as yet produced. The invitation to visit Pullman had been extended by the Car Company of that place, and Messrs. Stevens and Tibbets, representatives of the Lowe process, and Mr. George B. Burns, superintendent of the Pullman Gas Company; but their guests found a pleasing treat in store for themselves (aside from the inspection of the gas works), which had been anticipated by but few.

A description of this really marvelous metropolis in miniature, where every workman lives in a palace (or something very nearly akin to one), and where but two years ago the sod had hardly been turned to prepare the way for the erection of its first building, would here be out of place; so none will be attempted—none, in fact, could do the subject justice. So we will merely say that during the few hours of their stay the visitors looked with pleased interest upon the many objects of curiosity with which the place abounds, and it can safely be said that, despite the piercing wind and pelting rain, there were none present who did not feel well compensated for the discomforts of the journey.

The gas works, whatever may be said of the merits or defects of the Lowe process, like everything else in and about Pullman, was declared a model of neatness and symmetrical construction, and Mr. Burns, its courteous superintendent, was untiring in his efforts to explain and to please; and he succeeded to the satisfaction of everybody.

After a hurried tour through the immense car and machine shops, whose power is supplied by the world-famous Corliss engine of Centennial renown, the wet and wearied, but by no means dispirited excursionists wended their way to the Hotel Florence, where the wants of the inner man were pleasantly attended to. In may be remarked in passing that in this gem of a hotel, the architecture and arrangement of which are faultless, has been introduced one of those modern improvements which especially commend it to the fraternity—viz., that of cooking by gas. An immense range of ingenious construction, and furnished with every appliance which skill can devise, is used for the purpose, and it performs its functions admirably.

The repast finished, votes of thanks were tendered to Messrs. Tibbetts, Stevens, Burns, Goodwin, and Crane Bros., the gentlemen through whose instrumentality the members of the Association had been enabled to pass so pleasant a day. The six o'clock train was now in waiting for the return trip, and forty minutes later its passengers were landed in Chicago.

And so ended the fifth annual reunion of the members of the Western Gas Association.

LETTER FROM MR. PAGE.

[The following letter, received by the President just after the adjournment of the Meeting, is published, as it would have been read had it arrived in season.]

DUNROBIN, CASTLE SUTHERLAND,
May 5th, 1882.

Thos. Butterworth, Esq., Pres. Western Gas Association—

My dear friend: I remember with pleasure your kind invitation, after re-

peated by your Secretary, to be present at your Convention in Chicago, and I made due record of the date, promising to do so.

I little thought I should be lying on my back, ill in bed in Dunrobin Castle, Golspie, Sutherlandshire, in the extreme northwest of Scotland, overlooking the Moray Firth, in the ancient seat of the Duke of Sutherland, which his family have owned since 840—a part of the building being the oldest inhabited residence in Scotland.

I brought over, on the steamship Spain, twenty-three black bass, several from a pound to two pounds weight, as a gift to the Duke. I did what no man ever had accomplished before—I brought all but two through in good health, and they were placed in a beautiful Loch three miles long.

Pardon me so long reference to myself; but the contrast between Chicago, where I expected to be, and Dunrobin Castle, where I am, was so great that I could not refrain explanation at length.

I have been enabled to be of some slight service in "our" professional way to the Duke.

Learning that I had been identified with the utilization of coal tar and ammoniacal liquor, he informed me that he carbonized about 150 tons coal per annum here, but wasted both these valuable residuals!

Of course, I was shocked at such omission to realize something per ton of coal, and at once told him how he could obtain probably thirty-five (35) cents per ton of coal for his tar, and forty (40) cents for his ammoniacal liquor—or, say, at least $100, net, per annum for what is wasted.

Assuring you, and the gentlemen of the Association, that I shall employ much time during the ensuing weeks in securing information, respecting gas interests, of value to our friends in America, and, at the same time, impart something of interest as to what we are doing with the famous Ross steam stoker, McIlhenny Recuperator, and other regenerative furnaces, I remain,

Sincerely yours,

GEO. SHEPARD PAGE.

Appliances for Working in Irrespirable Gases.

By W. A. GORMAN.

The Fleuss apparatus represents a great improvement in this direction. It is self-contained and entirely independent of any communication with the outer atmosphere, thus enabling the wearer to breathe with safety in the most noxious gases, to walk any distance, and to explore the most intricate turnings of a mine with perfect freedom of action. The principle of the apparatus is that the wearer breathes same air over and over again, the carbonic acid being absorbed from it after each expiration, and at the same time the requisite amount of oxygen restored; thus rendering it pure, and fit to be again inhaled into the lungs.

The apparatus consists of a strong copper cylinder 6½ inches diameter, and 12 inches long, with domed ends, and capable of containing 4 cubic feet of oxygen, at 16 atmospheres pressure; this being sufficient for four hours' respiration. Above the cylinder is attached a square metal box, 12 inches by 12 inches by four inches; this contains the carbonic acid filter, which is a box of vulcanite divided into four compartments by vertical diaphragms, in such a manner that the exhaled breath of the wearer is made to pass up and down twice through the vessel before it is in a position to be again inhaled. This box is fitted with small cubes of india-rubber sponge, saturated with a thick pasty solution of caustic soda. The exhaled air, being finely divided as it passes through the interstices of the sponge, and coming in contact with a very extended surface of caustic alkali, becomes thoroughly cleansed of all the objectionable products of respiration. A flat bag of vulcanized india-rubber, 12 inches by 15 inches, is strapped on in front of the wearer, into this the exhaled air passes from the filter, by means of a tube of india-rubber. The bag is also in communication with the oxygen chamber, and the supply of oxygen to the bag is regulated by a jamb screw-valve, under the control of the wearer. The mask is made to fit airtight to the face of the wearer, and is held in place by straps buckled at the back of the head. A band of rubber is made to cover the ears, and the eyes are protected by glass when it is necessary to go into smoke or gases that would hurt them. The mask is provided with a pair of flexible tubes with valves, the one for inhaling being connected to the air bag. The slightest effort of inspiration brings the revivified air freely to the lungs of the wearer. The whole apparatus weighs 26 pounds and can be adjusted in two minutes. The author considers this apparatus particularly adapted for the use of coal mines, or when men have to deal with noxious gases.

Mr. Fleuss has remained in the densest smoke, as also in a glass chamber charged with carbonic acid, for a considerable time. His apparatus was regularly used for some time at the Westminster Aquarium, and also more recently at the re-opening of the Maudlin seam of the Seaham colliery after the fatal explosion in September, 1880. The author has to thank Mr. Fleuss for his kind permission to bring his improvements before the notice of the Institution.

In conclusion, the author may allude to the use of the electric light for submarine purposes. It is really the only light which can be of use to the diver, and of late the author has made some very satisfactory trials of it. The telephone has not been fully tested in practice, the divers preferring the ordinary signal line, or communication by a slate. The author added that since the paper was written ten lives had been saved at the Killingworth Colliery by means of the apparatus. The appliance, as stated before, was also used at the opening of the Maudlin seam of the Seaham Colliery.

Two Pittsburgh Industries.

The present great labor strikes, which had their inception in Pittsburgh and vicinity, have attracted the attention of the people of this country to the many and great industries centering in the "smoky city." A correspondent of the New York *Herald* has collected a number of statistics relating to the capital invested, hands employed, and values and quantities of material produced for the year ending June 30, 1880.

These figures, being taken from the United States Census Returns, are as authentic as it is possible to make them, and their perusal will afford great cause for wonderment at the marvelous rapidity of growth of trade in the region of the headwaters of the Ohio.

We extract the statements which relate to coal and coke—

COAL.

The wonderful prosperity of Pittsburgh as a manufacturing center is chiefly due to its possession of a vast vein of bituminous coal, unexcelled in quality for gas, steam, and domestic purposes. The area of the coal fields of the world is 260,000 square miles, of which the United States contains 192,000 square miles, or 74 per cent. of the total area. The bituminous coal field of Pennsylvania, which underlies the western portion of the State, and by which Pittsburgh is surrounded, is estimated to contain 14,000 square miles. It is not, however, from the mere matter of area in square miles that the value of a coal deposit is estimated. Its essential elements are quality, thickness, and regularity of its accessible veins, and the cheapness and sufficiency of transportation to market. The coal production of the world for 1872 was, in round numbers, 220 millions of tons, of which Great Britain produced the largest quantity, or 53 per cent. of the whole, and the United States the next largest quantity, or 19 per cent. of the whole. The census report of the coal production of the United States for the year ending June 30, 1880, shows the quantity produced to have been 42,417,764 tons, of which the three counties of Westmoreland, Allegheny and Fayette, which are largely dominated by Pittsburgh's capital, energy and brains, produced as follows:

Allegheny	4,426,871
Westmoreland	3,297,300
Fayette	2,318,728
Total tons	10,042,899

or nearly 25 per cent. of the entire quantity.

About 1,300,000 tons were shipped by rail, almost exclusively for use in manufacture of illuminating gas, and 1,000,000 tons were consumed in Pittsburgh for gas, manufacturing and domestic purposes.

In this interest I find—

Capital invested	$15,552,000
Hands employed	17,962
Value of product	$12,208,306
Amount of product (tons)	7,726,776

THE COKE INDUSTRY.

At the very gates of Pittsburgh, and tributary to its commerce, are located the interesting and unique coke making regions of Western Pennsylvania. It is a district which, like the oil regions, cannot find duplication in the world. The one product of this limited area is coke—a commercial fuel which is sought for by iron founders and smelters from Lake Champlain and New York on the east to Salt Lake and Omaha on the the west, and from Canada to the Gulf of Mexico. Coke is the product of slow combustion applied to the product of the region. This coal is a well defined portion of the "Pittsburgh coal basin," the vein varying in thickness from 8 to 11 feet, and worked at all depths below the surface of the ground down to 300 feet. The entire deposit of coal lies to the southeast of Pittsburgh, and varies in width from two to twelve miles, with a length of about forty miles, the northern end of the basin or deposit being near the town of Latrobe, Pa., and its south-western limit extending into the State of West Virginia—

Capital invested	$10,854,500
Hands employed	5,659
Value of product	$ 4,423,559
Amount of product (tons)	2,760,037

Some Wastes of Heat.

By William Metcalf, C. E.

Read before the Engineers' Society of Western Pennsylvania.

It is not the purpose of this paper to go into a discussion of the theoretical quantity of heat to be obtained from a pound of coal, as compared to the actual amount obtained. All this is to be found laid down in the books over and over again to stimulate engineers to try and stop the enormous loss shown, and many of the ablest men of the world are working at this fruitful problem. A far more odious and obvious comparison is intended—one that is ever present to us in the shape of huge volumes of smoke, and bright but expensive bonfires, that are pouring out of the tops of our furnace stacks, day and night. It is proposed to show by figures obtained from actual working data how much money is annually thrown away in Allegheny county by throwing money into our furnaces in the shape of coal, to be sent, wasted, out of the tops of stacks in the shape of dirty, useless smoke, and red and far more expensive flames.

FURNACE DATA.

The data of the old style furnaces are obtained from some of our ablest and most reliable iron manufacturers. The data of the new style furnaces are obtained from personal experience, and from a few iron makers who have tried and who are adopting the new style furnaces. By the old style furnace is meant the ordinary reverberatory furnace, and by the new style is meant any good regenerative gas furnace. The data of quantities of iron made are taken from the paper of William P. Shinn on "Statistics of Pittsburgh Manufactures," read before the American Institute of Mining Engineers in May, 1879.

The price of fuel is assumed as the probable average cost of the fuel laid down at the furnace. If the price should be too high or too low in any case, the correction can easily be made for any particular mill by parties interested. In stating that 40 bushels of coal are used in puddling a ton of iron, I am well aware that many iron men say puddling can be done, and is done, with 30 bushels per ton; but, on the other hand, some of the very best and most experienced men say that 40 bushels is nearer the actual figure of the amount used. Again, I have placed the quantity of slack used in a gas furnace at 20 bushels per ton of iron, which is the highest quantity I have ever known to be used, while I do know that 15 bushels is nearer the actual consumption, and there are furnaces now building which I believe will produce regularly a ton of muck iron with 10 bushels of slack. For the gas furnaces these figures include the consumption of fuel, and wages of gas makers from Saturday noon until Monday morning, during which time the furnaces are kept hot, and are idle. For heating, I have used equal quantities of coal for one style and of slack for the other, as given by iron men, although I am satisfied that this is an error in favor of the reverberatory system; but not having measured these quantities myself, I take the data of those who have made the comparison by actual measurement. I would call your attention particularly to the enormous difference by loss in oxidation, or scaling.

Difference in Cost.

We have, then, for puddling:

Old style—Coal, 40 bushels, at 6 cents	$2 40
New style—Slack, 20 bushels, at 3 cents	60
Difference in fuel	$1 80
Deduct for gas making	42
Saving in fuel in puddling 1 ton	$1 38

Reheating.

Old style—Coal, 18 bushels, at 6 cents	$1 08
New style—Slack, 18 bushels, at 3 cents	54
Difference in fuel	$0 54
Deduct for gas making	21
Saving in fuel per ton	$0 33

Loss by Oxidation—Scaling.

	Pounds per Ton.
Old style, 10 per cent	224
New style, 6 per cent	134.4
Saving in iron by scaling	89.6
89.6 lbs., at 2½ cents	$2 24

This gives us—

Difference per ton of muck bar	$1 38
Difference per ton in fuel, for heating	33
Difference per ton in scaling, for heating	2.24
Total saving in 1 ton of bar iron, once reheated	$3 95

Mr. Shinn's paper gives the quantity of rolled iron produced in Allegheny county in 1878 as 252,083 tons of 2,240 pounds. Assuming this, and multiplying by the figures just given, we have—

Loss in puddling, 252,083 × $1.38	$347,874 54
Loss in heating, 252,083 × $0.33	83,187 39
Loss in scaling, 252,083 × $2.24	564,665 92
Total loss	$995,727 85

An iron maker who was consulted in the matter estimated that 25 per cent. of the iron made is twice heated. Assuming for this quantity one-third of the above difference in scaling as a probably safe estimate, and all of the difference in fuel, we have: 74.6 loss for scaling × .33 fuel = 1.076 as the total loss in this operation. Twenty-five per cent. of 252,083 = 63,020; in round numbers, 63,020 × $1.07.6 = $67,869.52. Adding the above total $995,727.85 we have $1,063,537.37 as the total annual price paid in Allegheny county for the bonfires we keep at the tops of our furnace stacks.

At first sight it may seem incorrect to assume the loss in scaling at 2½ cts. per pound. You will understand, of course, that there is no way of getting at exact selling prices, and it is probable that, when we consider how much iron goes into special forms, that the "card" is about the average price. Again, the selling price is proper, because the manufacturer loses the material that scales away, less only the value of tap cinder. The workingman loses the wages of this amount, because it would increase neither his hours nor his labor perceptibly if the additional yield were made. And, finally, the manufacturer loses the profit of this amount, as its sale and distribution would not increase his expense account.

These figures are enormous, and fairly open to criticism; yet I know of one instance where a careful record of several gas furnaces, which cost from $10,000 to $15,000 each, showed that each furnace paid for itself every year; and of another case where a furnace which is not as well arranged as it ought to be, and which cost less than $6,000, showed a daily saving of $56, or $15,000 a year; and of another case, where the gas system was only partially in use, where there was a saving in the total annual fuel bills per ton of product of 46 per cent.

Several questions will naturally occur, such as: What is the wear and tear? How much flux does the new style furnace consume? What is the cost of a gas furnace? Will not slack increase in price, etc.? What sort of heat do you get? Is the work as good, etc.?

As to wear and tear, I believe it to be much less in the gas furnace than in a reverberatory.

A careful record of one run of a puddling furnace, when 552 tons of muck were produced, showed that the total cost of rebuilding, including castings, bricks, fire clay, and all wages, amounted to 32 cents per ton. For heating I have no figures; but I know of one furnace that ran six years, alternately heating iron and steel, before the crown gave out, and then only about one-third of it had to be replaced, and during those six years I do not think $50 all told was spent for little repairs, such as re-lining the doors.

In puddling strong pig containing not over 2 per cent. of silicon, about 350 pounds of flux, wet weight, are used per ton of muck.

Gas furnaces, including producers but not including royalties, can be built for about the same cost per ton of capacity as ordinary reverberatory furnaces. Slack might increase in price if all of the mills of Pittsburgh used only slack; but it is not likely that much increase would occur, because it is difficult for the river mines to dispose of a large part of their slack; and again, run of mine coal works so much stronger than slack in the producer, that it can be used at about the same cost per ton of yield of furnace.

The gas heat is uniform, continuous, and very soft; iron comes from the furnace thoroughly heated through without being burnt, so that the usual exclamation of men is, "it is as soft as butter." The work done in the gas furnace is, on the whole, much better than that done in a reverberatory furnace, because the heat is more uniform, and it requires the grossest carelessness to burn iron in a gas furnace.

Besides, the work is so very much easier for the men that they naturally do much better work, because their labor is not so exhausting, and they take more interest in it. This is a point of no little importance, for it is easy to obtain a very high quality of finish at no increase of cost; and when men are contented, the troubles of the "bosses" are very light. No account has been taken of the wages question, because, with the above stupendous figures it is a question not worth considering in this connection; but it is a fact that men can do from 10 to 20 per cent. more work on a gas furnace than on a reverberatory; they can do it easier and they can do it better.

Thefore, the new style gives the workingman a chance to make money too, without interfering with present lists; and the gas system requires as many hands as the other, if not more; therefore its introduction need cause no opposition.

It has been suggested that the publication of this paper, if the statements given are all correct, might injure Pittsburgh by inducing outside manufacturers to adopt this gas system. The fact is, shrewd manufacturers from

parts of the country as widely separated as New England and the Pacific slope, have visited Pittsburgh repeatedly, have examined this system carefully, and have adopted it extensively; have written back that they were delighted with it, and were pushing their changes rapidly. Under these circumstances it is barely possible that it is worth our while to look to our laurels.

In conclusion, I wish to say that I do not wish to be understood as claiming to be, in the works with which I am connected, in advance of the rest of the world.

We still use some of the wasteful style of furnaces, and a complete emancipation from old ways is always difficult to accomplish; but we are making as rapid a development of the use of regenerative furnaces as we can.

One field for the regenerative gas system is still unoccupied. I refer to the firing of steam boilers. Some Germans have recently shown that by gas firing 90 per cent. of the fuel will evaporate double the quantity of water in a given boiler. This simply means that any concern can double its steam producing capacity at a very trifling cost, and with no increase of plant. A battery of boilers is now being fitted in this city with regenerative gas fires, and if the results claimed by the Germans are realized, the facts will be laid before the Society at an early day.

In the meantime the subject commends itself to everyone who is interested in economy and cleanliness.

The economical side of the question has been shown; the cleanly side is accomplished of necessity—first, in the greater cleanliness of the works, and, second, from a reduction of the smoke nuisance; for it is well understood by all who know how to work a gas furnace that a smoky stack is a sign of a furnace that is in bad order; therefore smoke from a gas furnace is always inexcusable.

DISCUSSION.

Vice-President Rodd, in the Chair—I think Mr. Metcalf could not have chosen a subject more interesting to Pittsburghers generally, and one which concerns them more intimately. I hope it will receive the full discussion which it merits.

Mr. Parkin—As the President has pretty well covered the ground, I can add but little. I have operated gas furnaces for about ten years, using them for almost everything, such as annealing at a low red heat. We have used them for heating steel and for melting. The highest imaginable heat is necessary to melt steel. Recently we have adapted them to welding cast steel. Of course there are many objections made against the gas furnace on the ground that it does not work satisfactorily, almost all of which are due to faulty construction. If the gas furnace be properly proportioned and constructed it will give satisfaction. A great many objections are from the fact that furnaces are not properly proportioned. Where properly proportioned they are simple, and give a uniform heat. The furnaces are perfectly clear. There are no unsightly objects around, such as are ordinarily seen about reverberatory furnaces.

Mr. Kirk—I would like to ask, if there are so many advantages for iron men, is there a corresponding advantage for household purposes? Can the same principles be adapted to household use?

The President—I think that in not many years from now the subject will be better understood. The principles can be adapted to household furnaces almost as cheaply as coal gas, even at the present price of gas. One of the important differences between the new and the old furnaces is in the melting of steel. In the old style it requires 150 bushels of coke for one ton of steel. Only 15 bushels of slack are needed with the gas furnace. There is a saving in puddling of two-thirds, in melting about nine-tenths, and in heating not so much.

Mr. Hunt—I would like to ask if there is any difficulty from explosions?

The President—We have never found any at all; I do not know that we could make one explode. In the gas made, only from 20 to 25 per cent. is combustible material, the balance is nitrogen and carbonic acid. Some very simple results have been obtained already. When Dr. Siemens was in this country in 1876, he examined the natural gas furnaces then in use. One mistake made in the beginning was the attempt to superheat the gas. Dr. Siemens said that he had tried in every way the generative system on hydrocarbon gas. By using the regenerative system only on the air, and bringing the gas on cold, then the most intense heat could be obtained from hydocarbon gases with the greatest economy. I am certain that someone will take up this household problem. It would not cost more than the present use of coal.

Mr. Hunt—I agree thoroughly with the speaker. I believe the gas furnace should supersede the old reverberatory furnace. They do not cost very much more, especially since the Siemens patents have run out. Until the men got used to them they were not as successful as they should have been, requiring more skilled help to run them; but of late they have been worked well by ordinary furnace men. I believe it is going to be proved that the old style furnaces are out of date. Another thing—in other countries different kinds of fuel are used in gas furnaces. In Sweden they are using sawdust, and make from it a quality of gas superior to ours in not having sulphur in it. Frequent explosions occur in the Swedish gas furnaces using a blast of air in the producers. We have no trouble of the kind in this country. Most of our gas producers use only the chimney draught, and do not use the direct blast. A great many gas furnaces are being used. There are several other forms than the one described, several of which have given considerable success in use.

Mr. Kirk—I would like to know if Mr. Metcalf will undertake to give us at the next meeting the dimensions or plan of some general apparatus for individual, isolated houses.

The President—I refer the gentleman to someone who works in that line. I referred to the gas generative system which I believe will soon come into use.

Mr. Miller—I think the subject is nowhere near to being exhausted; some gentleman have more to say. I therefore move that the subject be continued until the next meeting.

Mr. Gottlieb—Mr. Reese here assumes that the force is 772 foot pounds in one unit. This is a very important factor in all his calculations. I would like to know how this is obtained.

Mr. Reese—I am not prepared to give the formula. These figures were used by Dr. Siemens in his paper before the British Society. I have never been able to get the formula by which Dr. Joule got at that calculation. I would say that I am aware of the importance of the subject, and I do not feel that I shall be able to answer all the questions that may be put at this time. I would be glad to have the subject thoroughly discussed. What we want is light. If there is anything here that will lead you to discussion, I hope you will bring it out. I am as thankful to receive notice of errors as to receive the congratulations of my friends. I hope there will be discussion on this subject, if not this evening at some subsequent time. I would like to succeed in drawing your attention to this very important question of the day.

Mr. Dempster—I am not opposed to the discussion; but I thought we had a rule that papers were not to be discussed until the following meeting, so that they might be printed and the members thus have time to consider them?

The President—The rule passed was that papers could be discussed on the night they were read, if the members desired it. The intention was not to cut off discussion immediately.

Mr. Reese—I observe quite a number of gentlemen present who are not members. We would be very glad to have them engage in the discussion. Those not members, I believe, are at liberty to take part in the discussions.

The President—I have no doubt but that the gentleman's remarks were aimed at the Chancellor of the University.

Chancellor MacCracken—Certainly in this presence I will have to decline saying anything upon the paper presented this evening. If the Society of Engineers of Western Pennsylvania is not ready to discuss important question, certainly one like myself should not say anything upon such short notice. I came with especial desire to hear the discussion of the paper read a month since, which I understood, according to your rules, would be taken up this evening.

Mr. Dempster—I would call the attention of the Society to the point that we only get from 5 to 10 per cent., at the maximum, of the heat energy from our coal. If that is all we get, it is an important subject, and should receive the attention of those engaged in that department. It is to be hoped that those who are prepared by experience and observation to discuss this question will not let the opportunity go by.

The President—In regard to the quantity of coal in Western Pennsylvania lying above the water level, excluding veins less than three feet thick, making liberal allowances for slate and increase in production of coal, it has been shown that we have 500 years' supply. We therefore have abundant time to consider the question. Mr. Reese's figures in the formula are no doubt correct, so far as they go, but he disregards the two per cent. of oxygen and the six per cent. of ash. It would be well worth while to consider this in investigating his figures used in the operation of converting units of coal into heat. Will Mr. Dempster favor us with a few remarks?

Mr. Dempster—I was unfortunately absent from the last meeting, and, not having received a copy of the paper, I have not seen or heard a word on the subject.

Mr. Jarboe—A great many new inventions are coming up in this line; I understand Mr. Reese has one. Many forms of gas furnaces are now in operation—Wilson's and a number of others. Pittsburgh will be likely to lose her laurels if we do not take active steps. I saw a furnace in Boston which burned about 3,500 pounds of slack and about 20 per cent. bituminous coal. The New York Heating Company has a gas furnace of 150-horse power. The Brush Electric Light Company uses this kind.

The President—Will you give us a section and description of that furnace?

Mr. Jarboe—I did intend to give it this evening, but the data did not arrive. It would not cost over $130 per boiler.

Mr. Gill—There is a little matter which came under my notice. An acquaintance was making an investigation for a manufacturer in the iron business to decide certain questions connected with the establishment of new works. I made a number of visits with him, and in the course of the investigation we found a considerable difference in the amount of coal consumed in the different establishments in producing one ton of iron. In one case the amount consumed was 50 per cent. more than the minimum; another 100 per cent.; another 150 per cent. more fuel. In the concern consuming 150 per cent., the very best coal was used. The minimum one used slack and coal—*i. e.*, for puddling. The greatest difference, of course, was in the construction of the furnaces. In giving this statement I simply give in general the information obtained. I am not at liberty to give the exact data.

The President—I would like to inquire whether the figures were taken from the books or not.

Mr. Gill—They were, in every instance.

Mr. Reese—The rate would be very low in producing the heavy grades of iron, but the finer iron would take a good deal more fuel. I cannot conceive of such great differences in puddling in Pittsburgh. I have never known a person to give figures of over 42 bushels per ton in puddling. Scarcely over 40 bushels is the average for puddling.

Mr. Gill—In the one consuming the largest amount of fuel we have the books to show for it; I made the calculations every day myself.

The President—One of the largest manufacturers in Pittsburgh told me that he had the matter under consideration for a long time, and that there was a loss of 20 per cent. in fuel in one ton of pig iron, while in reducing pig to wrought the loss was from 12 to 15 per cent. In regard to puddling, I will say that with our furnace, in making over 6,000 tons of iron, the highest consumption we could get out of it was 20 bushels of slack to one ton of muck iron.

Mr. Gill—I would like to state that Mr. Metcalf was not puddling iron at the time the observations I have mentioned were made.

The President—In regard to workingmen, we have never had any serious trouble. After the men have once worked on a gas furnace you cannot drive them away. There must be some one person who thoroughly understands the principle of the furnace and every detail. It only takes a very little teaching, and a good man will go along very straight.

Mr. ———.The great trouble has been about royalty on these furnaces, amounting to from $10,000 to $15,000. I understand that a number of patents have run out. The Chester Furnaces, at Thurlow, are now putting up a furnace on the Siemens patent, now run out, without paying for it.

Edward H. Goff to the Board of Aldermen of the City of Boston.

To the Editor of the Boston *Post*:—

I regret the necessity which forces me to address an open letter to the Board of Aldermen of Boston. I sent a letter to the Board a week ago, with the request that it be presented and read that day without fail, as it alluded to a matter upon which self-respect forbids me from keeping silent any longer. For reasons which I fail to understand, it was laid over, to be presented at the next meeting of the Board, which was held to-day; and this evening, after the Board adjourned, I am informed it was quietly pigeonholed. I inclose a co y, and by publishing it as an open letter in your next issue you will confer a special favor.

Very respectfully,

Boston, June 12, 1882. Edward H. Goff.

Office American Electric and Illuminating Co.,
Boston, June 5, 1882.

To the Honorable the Mayor and the Board of Aldermen of the city of Boston:

Gentlemen:—In assuming the duties of president of the American Electric and Illuminating Company of this city, to which I was elected on Saturday last, I have had to deal with its existing business relations as I find them.

I find upon the books of the Company an application to your honorable body for a contract to furnish the city of Boston with 100 electric lights upon similar terms to those granted the "Brush" and "N. E. Weston" Electric Light companies, and learn that your committee on lamps had voted to grant the contract at 58 cents per lamp for burning all night, and then referred it to your board for its approval.

In reading the account of the proceedings of your honorable board, and the discussions upon the subject, it appears that the application met with a determined opposition from two members of your board, and, if I am correctly informed, the most uncalled for and vindictive personal attacks have been made upon me by the same gentlemen, for what rerson I am unable to say, as I never had any business relations, either directly or indirectly with them, and do not even enjoy the honor of their acquaintance.

I am informed that these same gentlemen have denounced me because of my connection with the defunct "American Electric Light Company of Massachusetts," and that this is made use of as an argument against me and the application in question, and that "The American Electric and Illuminating Company" is called by these gentlemen, a "swindle and stock-jobbing concern," endeavoring to "plunder the city of Boston.

I will not admit that I am weak-minded enough to feel very deeply injured at this attack, inasmuch as a careful investigation of the real facts in the case will fully exonerate me from such unfair criticism.

It is true that it was my misfortune to have accepted an official position in the defunct company last January. I was induced to join the company because of the flattering inducements held out to me regarding the enormous value of the patents which it was stated the company owned, and the implicit faith I placed in the honor and integrity of the eminent public and financial men who were connected with it, and for the more patent reasons that it was introduced into this city through the medium of the city government of Boston, and the first public exhibition of its electric apparatus which I ever saw was made in the mayor's room, at the city hall, where it remained for several days, and the manipulators of the scheme were given permission to invite the public in to see it. Permission was also given to place the lights in the aldermanic chamber By whose authority this favor was granted, which gave public endorsement to the organizers of the company, or the consideration given for it, I am unable to say. I only know my confidence was completely won, and upon the city government of Boston largely rests the responsibility of my having been deceived.

The affair caused my financial ruin, as I paid from my own pocket every dollar that was expended for or on behalf of the company during my term of office, and have since been unceasing in my efforts to save others from loss.

I now respectfully submit for the consideratian of your honorable body whether such unkind and undignified attacks as have been made upon me by two members of your board are just or honorable?

I have submitted silently and patiently not only to the unjust attacks above alluded to but to the unfair criticisms of a portion of the public press regarding my connection with the American Electric Light company of Massachusetts, until I feel it a duty to myself as well as my business connection to make this statement.

Fully believing in the great importance of the subject of electricity and its immense value over all other known methods for illuminating purposes, I rendered all the assistance I could in establishing "The American Electric and Illuminating Company," which I may say here was organized and is now operating its electric lights as a legitimate business enterprise, with no other purpose in view than conducting business upon its merits and for the profits which may honestly be made from it.

As the company under my management will have no other policy than one for a profitable and legitimate business, and as the price named by your committee on lamps cannot be accepted by any company without heavy loss to its stockholders, as a 58 cent rate for burning all night would be about equivalent to 25 cents for burning until midnight, (the standard rate for which is $1 per night to business houses), and if an underground system is required for the common and public garden, the cost would be at least four times as expensive as the present system of elevated wires. I cannot jeopardize the interests of my company by any such methods of advertising, and therefore beg leave respectfully to withdraw the application unless the contract is given upon remunerative terms.

If your honorable body will kindly consider the pending application from this company for establishing poles upon various streets, I will feel obliged.

Thanking the members of your honorable board who have given the company their generous support, I have the honor to be, gentlemen,

Very respectfully,

Edward H. Goff,
President.

Extending the Water Works of St. Louis.

Work was lately commenced on the foundation for the new high-service engine at the water-works. Reference to the magnitude of the new water-works extension has been made on several previous occasions, but it will be more clearly understood when it is stated that the foundation alone will cost $90,000, and the building to be constructed upon it $250,000, and the engine to be placed in it about $14,000. The large cost incident to the foundation and building is occasioned by the massive stones and heavy iron to be used in the structure. The Water Commissioner is of the opinion that the new engine will arrive at St. Louis about next October, and will immediately be placed in position.—*Globe-Democrat.*

A Failure.—The electric light has for nearly a year been in use at the Victoria Railway Station at Manchester, England, but it is now pronounced a failure by the Lancashire and Yorkshire Company.

[From the London "Journal of Gas Lighting."]

West of Scotland Association of Gas Engineers.

The Tenth Annual Meeting of this Association was held in Dumbarton, on April 27th, with the President, Mr. S. Dalziel, of Kilmarnock, in the Chair.

After the transaction of the usual routine business, and the election of officers for the ensuing year, Mr. Dalziel delivered the following valedictory address—

On the last occasion on which I had the honor of addressing you, I referred more particularly to the relation in which the electric light then stood to gas light, and to the necessity of every gas manager being thoroughly up in the details of his profession—that is, as a manufacturer of gas; and I drew your attention to Mr. Newbigging's "Golden Rules," which will bear to be frequently repeated—viz., "Keep up the heats of the retorts; keep up the water in the meters; keep down the pressure in the mains during the daytime; and keep down the arrears in the gas ledger." These matters, if attended to, give us a good foundation on which, in a large measure, success depends; and to a considerable extent they are under our control, being, as it were, constantly before us. The daily record of the station meter shows us if the retort men are doing their duty; the monthly return of the consumer's meters informs us whether or not the surveyors are looking after their business; the daily attention required to regulate the pressure is recorded by the tell-tale; and a regular inspection of the consumers' ledger helps to keep down the arrears and swell the balance at the bank. These, though the most prominent, are but a small part of a manager's duties. There are many details—such as condensing, scrubbing, purifying, pipe-laying, etc.—that require constant and systematic supervision, which, if not carefully and well done, will render all our efforts futile, and detract from the results we would otherwise obtain. To these I will now direct your attention for a short time.

Those of us who are in modern gas works, where, as a rule, all the apparatus is of sufficient size for the largest make of gas on a winter day, find everything, from the retort-house to the holder, works smoothly and efficiently; but others who are in old works, hedged in on all sides with a constantly increasing make of gas, have no sinecures, and are often at their wits' end, to send out to the consumers gas as well purified as it might be. If there is one part of the works more than another that should have special supervision, it is the purifying apparatus, as it is from this that most of our troubles within the works arise. If gas is sent out clean, there will be little trouble with the consumers. There is no part of a gas works plant on which money can be laid out to greater advantage to all concerned than in the purifying apparatus. No matter how a manager may be hemmed in, every effort should be made to have sufficient power to meet all demands in this department. Gasholder room is, of course, a necessity; but about half of it can be dispensed with for six months of the year. This is the case also with the retorts and the condensers. But it is very different with the purifiers, which can hardly be too large. We often overlook the fact that the manufacture of gas is a chemical operation; that the physical conditions of the materials we employ are entirely changed; that in these changes time is an important factor in giving satisfactory results; and hence the necessity of having the purifying apparatus especially of ample size for our requirements.

In the retort-house, to make gas in quantity, quality, and permanency, a good sharp heat, so that the carbon vapors may be quickly transformed into the gaseous state, and drawn away from the retorts as made, are the conditions required; but as soon as the gas enters the hydraulic main, and is passed on to the condensers, time plays an important part, and this must be given, in order to allow the gas to give up its tarry matter. Many theories have been advanced as to the nature of condensation, and many systems have been tried; but all are now agreed that it should be slowly done—that the gas should be leisurely passed through—nay even, if this were possible, brought to rest in the condensers, so that the fixed vapors might have time to settle. Gas may be cooled by being passed hurriedly through the condensers. But the condensation will be imperfect, because of the rapidity of the current, the gas carrying the particles of tarry matter forward; whereas, if passed sluggishly through, condensation would be all that could be desired. Yet we should ever bear in mind that the temperature should not be permitted to fall below 50°, and certainly not below 40° Fahr. The richer the gas, the greater is the necessity for this department of the purification being attended to carefully, as rich gas suffers greater deterioration in being subjected to cold. Experiment has shown that from 1000 cubic feet of a rich gas may as much as 4.42 cubic feet of rich hydrocarbons be abstracted by reducing the temperature to the freezing point. The moment this gas enters the hydraulic main the struggle for existence begins between the "affinities" the relative energies of which vary with every reduction in temperature; showing that there is a necessity for observing closely the temperature at the inlet and outlet of the condensers, and of recording the same for future guidance. These records give an indication of the condition of the gases as they pass forward to the scrubbers and purifiers, neither of which will perform their work satisfactorily if the gases are tarry, and higher in temperature than they should be. It is desirable that extremes of heat and cold should be avoided, of the sun in summer and of frost in winter, as the nearer we can keep the condensation to an equable temperature, the more to be depended upon will be the action of the other parts of the purifying apparatus; therefore you will perceive the necessity of having the condensers so constructed that part can be thrown into and out of action as occasion may require. It has been well said that "condensation is half purification." If the gas is not properly condensed before reaching the scrubbers or purifiers, the material employed there will be covered with a thin film of tar, and become as it were hermetically sealed, thus destroying its action. If we would be successful in purification we must begin at the beginning—viz., the condensers.

The washer or scrubber follows the condenser; it also follows the exhauster, if there is one. I think in small works this part of the process of purification—washing or scrubbing—has not received the attention its merits deserve. Little attention has been given to it, the difficulty in small works being the want of motive power; but now that gas engines can be obtained of all sizes, there is no longer any excuse for this department of purification being neglected. There are also several self-acting scrubbers—one of which was brought before your notice at the last meeting—which are simple in construction, and perform their work admirably. Therefore there is no justification for permitting the valuable bye-product ammonia to pass on to the purifiers, thereby increasing the cost in that department, and when the purifiers are changed, causing the lime to give off such vile odors that to some the very name and neighborhood of a gas works are odious. If the gas is well washed or scrubbed, the smell produced when the purifiers are changed is reduced to a minimum; the ammonia, which would otherwise be lost, becoming a valuable bye-product. Scrubbing pays itself, by doubling the quantity of ammoniacal liquor, and that of a greater strength than condenser liquor. The process is very simple, and the expense—well, there is no expense; it pays itself, and leaves a good margin over. In doubling my scrubbing power, I doubled my income from liquor, from which I paid the cost of the additional scrubber, and had something left the first season; it did not cost me even an additional gallon of water. I may state here that I have two scrubbers, the last of which is always nearly clean water. Those of you who have no scrubbers should at once introduce them. I am certain, whether you adopt self-acting scrubbers, or motive power for pumping the water, in almost every case the expense would be repaid in the first season by the increased quantity of liquor obtained.

The purifying of gas from ammonia is one of the simplest operations in a gas works. Water, the agent employed for the removal of the ammonia, has so strong an affinity—I prefer the word "attraction," as it is not a chemical change, but a mechanical addition—for it at the ordinary temperature, that it will absorb 700 times its own bulk, and under pressure it will absorb more in proportion to the pressure; also the lower the temperature of the water, the more ammonia will it hold in solution. The secret of good scrubbing is to present a large surface to the gas in its passage. My first scrubber is filled with boards, made the same as purifier grids, but six inches deep; in my second scrubber the grids are the same, but made diagonally, and placed so that they lie zig-zag, crossing each other alternately, thus presenting a large wetted surface, giving the gas a good combing, and abstracting not only all the ammonia, but also a portion of the carbonic acid and sulphuretted hydrogen, and relieving the purifiers of a portion of the duty which specially falls on them.

I now come to the purifiers. Of them much has been said and written. We are still using the same material—lime—for purifying as in the early days of gas lighting, which says much for the shrewdness and ingenuity of our fathers. It is, I may say, only recently, if even yet, that gas managers have understood the theory of gas purification; and anomalies are occasionally occurring that still puzzle research. But we now fully realize how much one department of purification depends on another. The principle that overlies all is the single one of affinity. In the scrubber there is the affinity that water has for ammonia, which is so great that if a phial is filled with ammonia gas and inverted in water, the water will rush violently into the phial and fill it. In the purifiers, affinity also comes strongly into play; and here it is that most time should be given for the materials to perform the duties assigned to them. Here we have the "affinity for opposites"—acids for alkalies and alkalies for acids—refuting the proverb that "like draws to like." In this matter we are indebted to Mr. R. H. Patterson, who has shown, in his admirable work on "Purification," that there is also an "affinity for similars," or "like for like"—carbon for carbon, sulphur for sulphur in other forms than sulphuretted hydrogen. Hence the advantage of employing more than one material—lime—as in small works, by using oxide of iron in addition; but before the gas reaches the lime forms of sulphur other than sulphuretted hydrogen are taken out, thus making it purer and more fit for the purpose for which it is intended—viz., gaslight. In preparing these materials for purification, let them be well handled; good materials may be

spoiled in the handling. Let nothing be done in a slovenly manner, and let every part of the apparatus for purifying be kept clean; it will repay itself, give a better return of bye-products, a large sale of gas, and help to prevent that bugbear of all managers—a choke. It is only recently that oxide of iron has come into use in Scotland. I have lately begun to use it, and cannot yet say much as to the cost of purifying with it; but this I can say, that the spent lime is nearly odorless, and the offensive stench that filled the air when a lime purifier was changed is all but gone. I expect the day will come when all these operations will be carried on in close vessels without prejudice to the community; and purification in its every branch, instead of being a large item in our expenditure, will then become a source of revenue.

I will now say a few words on escapes of gas. This is a great source of loss. A small escape is often looked upon as only a trifle, while really the loss is often more than could be credited. I had lately an escape, at a valve which had been turned shortly before I passed, and had been left without the escape being noticed. In passing I detected it at once, yet it was so small that three men working beside it did not notice it. To myself it was apparently very trifling, yet it occurred to me to see exactly the result; so I allowed the escape to go on for that day—12 hours. To my astonishment I had lost 3000 cubic feet of gas. In order to prove it, I permitted it to go on for another day, with the same result; another result being a lecture to the men on the want of attention to little things, and on keeping a sharp lookout for "trifles" such as escapes. I tried to impress upon them that every man in a gas works should have a watchful eye, a quick ear, and a keen sense of smell—that nowhere can the "little foxes" do more damage. The article we manufacture is unseen, and in some cases is so dangerous—it is so subtle in its nature that it was well-nigh being placed among the imponderables—that no vigilance, however great, no foresight, however far-seeing, can prevent loss, or evade those lamentable occurrences that sometimes destroy valuable property, and worse still make wives widows and children fatherless. Of this we had a very striking example in the Henderson street gas explosion—and the lesson for us should be that every man in connection with a gas works should be taught to be ever on the lookout; that surveyors of meters, and also collectors, should at once report escapes in their rounds, and keep their eyes open, so that a subsidence in the ground, or anything likely to injure the mains, could not occur without being observed. It is very important that the senses of seeing, hearing and smelling should be carefully educated by all gas managers. The last-named sense cannot be too often exercised. It may become so fine that the different stages of the manufacture of gas, from the retorts to the holder, can be detected, and lead to finding out where escapes are going on. It is part of my instructions to all my men to report at once if they observe anything out of the usual course of things.

Among the helps a manager should have no lack of, are pressure gauges. They should be placed on all parts of the apparatus, so that the condition of every department may be seen at a glance; and of them there should be a constant and systematic inspection and record. In a gas works there should never be such a thing as passive permission, or taking things easy. Action at once ought always to follow where there is the slightest suspicion that there is anything wrong. We all know how susceptible gases are to variations of temperature, a sudden change of which may lead to disastrous results. To some these remarks may appear unnecessary; but, as I said, on the last occasion, most of us are managers of small works, and my remarks are chiefly intended for them.

Hitherto all I have said has been addressed to you as gas manufacturers. There is another aspect in which it is time, I think, we should appear; and that is as gas salesmen. In every department of commerce business is pushed to the utmost, and beyond its capabilities; but gas managers hitherto have had a monopoly of the article light—gaslight—and have been content to let business come to them, instead of looking for and pushing it, as a merchant would do. As men interested in this particular manufacture, I believe each one has done, and will endeavor to do, his duty toward his employers, the companies; but so far as our customers are concerned, with a few exceptions, we have signally failed, and it has been left to men outside the profession to write and teach the people the use and abuse of gaslight. This has not arisen from ignorance. Probably it may have arisen from the fact of mankind being so constituted that we do rarely find in any business the talent for manufacturing and selling combined in the same individual. Perhaps division of labor is the thing wanted to perfect the machinery for selling gas. I am of opinion that it would pay most companies to have a man to attend to complaints, to examine fittings, show and sell burners, and instruct consumers how to burn gas. But even supposing the public did know fully, in this age how few there are who can find time, or will take the trouble, to examine for themselves wherein lies the deficiency of their gas supply. To make and supply gas is the aim of gas manufacturers. But they ought to go further, and more especially corporations who have acquired gas works. They are the custodians of the public good, and, through their Dean of Guild Courts, should not pass any plans for building without endorsing on them that all gas fittings are to be subject to the regulations of the gas committee; specifying the different sizes of pipes to be used, and that the meters are to be placed near the center of the house, so as to be removed as much as possible from climatic changes. If this were done there would be few, if any, complaints of insufficient supply, or of bad gas. It is far more incumbent now than ever that gas managers should bestir themselves, and show the public the capabilities of gas for lighting, heating, and cooking. By doing so it would soon become as much the business of every gas company to sell gas for heating and cooking as for lighting.

There have lately been discussions as to the propriety of reducing the illuminating power of gas. This, I think, is a mistake. One city is for reducing the power, and another considers it to be in the interest of all that it should be increased. It has not yet been shown that low illuminating power and low price are cheap. The facts are all the other way. English towns are supplied with gas at prices ranging from 20 to 50 per cent. less per 1000 cubic feet than those charged in Scotch towns; but the former have from 10 to 20 per cent. less light. By reducing the illuminating power we shall have cheaper gas per 1000 cubic feet; but it will cost us more for light. To some it may be a small matter; but two-thirds of every community are on a winter day dependent on gas light for their daily bread. It is necessary for us to consider the case of the poor, who have to stitch away from morn till night and night till morn, and supply them with light of a high illuminating power. As this subject is to be discussed to-day, I will not say more than that Scotch gas of from 26 to 30 candle power can do all that common coal gas can do—drive gas engines, heat, and cook—and every foot of gas will give from 80 to 100 per cent. more light; therefore, why change? Moreover, there is a competitor—the electric light—taking the field. If gas managers had exerted a tenth of the energy that the electric light companies have done to exhibit their light, the demand for gas at this moment would be far ahead of what it is. It is light that consumers want, and will have, let the cost be what it may; and therefore I think there could not be a greater mistake than to lower the illuminating power of the gas. If gas companies will not give it, electricians will, and to reduce the illuminating power is equivalent to handing the electric light companies a passport to step in and take possession of what rightfully belongs to us. I would recommend to your careful perusal the pamphlet by Dr. Adams, on "The Gas Question, Economic and Sanitary." You will find the question of the illuminating power treated in a scientific manner in relation to light, showing that rich and high-priced gas is the cheapest to the consumer, and what is of as much importance, the sanitary conditions following the combustion of good gas are all in its favor.

As to heating and cooking I think Dumbarton has taken the lead. A paper was read before the Philosophical and Literary Society, in November last, by Mr. William Denny, F.R.S.E. He has shown that from the kitchen to the drawing-room there is a saving in having gas fires for heating. There is the first cost for gas, which is higher than that of coal; but then if we consider the dust, dirt, and the din—from the filling of the scuttle with coals to the sweeping of the chimney—the advantages are in favor of gas. To quote the words of Mr. Denny—

"Besides the direct advantage of saving in domestic labor by gas fires, there is the further advantage, that wall papers and all kinds of drapery and fittings are likely to be more enduring with gas fires than with the dusty products of coal combustion. Another great advantage which would result from the general employment of gas fires would be the abatement of the smoke nuisance, which now forms a problem for solution in all our large towns."

In referring to invalids he says—

"The even temperature which can be produced and maintained with certainty, not only by day but by night, must be a very great boon to persons of a delicate constitution, and is, in many diseases, one of the conditions most necessary for complete recovery. Last winter, in my house, although the temperature produced by gas fires was never so high as that produced previously by coal fires, one undoubted advantage resulted, and that was the complete freedom from colds enjoyed by the household. We had not one single case of cold during the whole winter, and I find the experience of another gentleman, who has used gas fires alone in his house, corroborates mine."

These words from a gentleman quite outside the profession should cause every gas manager to think how he can best show the advantages of heating by gas. I have no doubt many consumers, if shown how, would readily adopt this mode of heating.

In regard to cooking, a few of my consumers use gas for this purpose; and I can say, from my own experience, that any one who gives a gas-cooking stove a fair trial will not readily give it up. For roasting, boiling, stewing, and that nice operation in cooking called "simmering," gas beats a coal fire hollow, as the heat can be regulated with certainty to any degree of temperature; and I think it is our duty to assist our consumers, and introduce to them what experience has shown to be best and cheapest for this purpose

with our rich Scotch gas. In helping them we help ourselves. If we could increase our sales during the summer months, it would be almost all clear gain, as nearly two-thirds of our plant is then idle; while by keeping it employed it would assist materially in an all-round reduction in the price for all concerned.

The reading of the address was listened to with close attention; and, upon its conclusion, on motion of Mr. Niven, a vote of thanks was accorded to Mr. Dalziel.

A Microscopic Examination of Cement.

At a meeting of the Paris Academy, a paper was presented by M. Daubrèe on behalf of M. H. Le Chatellier, on this subject, which adds considerably to our knowledge of the composition of slow-setting cements. It will be noted that the writer differs somewhat in some of his determinations from the views hitherto held by others. The author says—

For some time past I have been carrying on a series of experimental investigations on the composition of slowly-setting cements, so-called Portland cements, and on the theory of their hardening. As I am temporarily compelled to interrupt those investigations, I give here the results obtained up to the present time, although they are not yet complete. If we examine under the polarisation microscope a thin slip cut out of the vitrified slag as it comes out of the Portland cement kiln, we notice chemical substances distinctly different in their character. I tried to determine their nature by comparing their optical characteristics with those of artificially produced lime combinations. The substances offering the most striking characteristics are the following:

1. A substance which has no effect upon polarized light. It consists of aluminate of lime rich in lime, and sometimes mixed with free lime. I have, indeed, produced the three-basic aluminate of lime, Al_2O_3, 3CaO, and shown that it crystallizes in the tesseral, consequently polarically inactive system. I have also proved that this is the only aluminate of lime combination which crystallizes in this system.

2. A substance which has a slight effect upon polarized light, and shows very neat crystalline forms. This is a silicate of lime. I recognize in this the principal, if not the only effective, element in cement. This substance always forms the greatest part, and sometimes even exclusively the whole mass, of cement. I think I am able to affirm that it is a lime peridote (lime olvine), SiO_2,2CaO, which forms during burning, and is melted in the following substance and then crystallizes.

3. A substance colored intensely brown, and affecting polarized light. This is the most easily melted substance contained in the cement; in a solid state it forms the base and in the melted condition the matrix for the crystallization. It is a ferro-aluminate of lime. I have given it the formula of $2(AlFe)_2O_3$,3CaO. I have produced directly the combination corresponding to this formula, and found in it both the optical properties and the easy fusibility of the element contained in cement. This substance changes very easily in water.

4. Small crystals, which act very energetically upon polarized light. They are probably combinations of magnesia, for I have observed that all strongly basic combinations of lime are easily decomposed in water, in contrast to combinations of magnesia.

The principal elements of cement are, therefore, in the first place, a peridote of lime (SiO_2,2CaO); in the second place, one or more aluminates and ferrates of lime. The existence of crystallized aluminates of lime in cement has been already noticed by Fremy, the data of which formed the starting point of my observations. As regards the successive phenomena during the hardening process of cement, I have been able to ascertain the following in the microscope under polarized light. Several combinations are produced by the operation of water. That which plays the principal part during hardening crystallizes in hexagonal scales, which may correspond to hydrate of lime. I have hitherto been unable to collect sufficiently large quantities for determining directly the composition. No doubt it is a product of the decomposition of peridote of lime. Indeed, it occurs much more frequently in those cements which contain this silicate exclusively, and in alumina. There are also formed, but only in cements containing alumina, long needles, which intertwine with each other in all directions, like felt, and the proportion of which in the mass increases considerably in quickly-setting cements. Those crystals lose water in dry air, being reduced in bulk at the same time; heated in water over 50°C., they break up, and are changed to dust. They originate in the operation of water upon the three-basic oluminate, as I have shown in the case of those directly produced aluminates. I have further ascertained that the body Al_2O_3,3CaO is decomposed in pure water, in the proportion of 0.3 gramme per liter, while in salt water a much larger quantity is dissolved, but only partly decomposed.

These observations explain the ascertained differences which appear in practice between slowly and quickly setting cements. Quickly binding cements are always richer in alumina. I have also recognized the formation of other substances during the hardening of cements, which do not affect polarized, but I was unable to determine them, either with regard to their composition or with respect to the part which they play in hardening. Peridote of lime ($SiO_2$2CaO) has another curious property, which may supply the key to a frequently recurring phenomenon in cement manufactories. Heated to the softening point—*i.e.*, to the melting temperature of soft iron—and then quickly cooled, it forms at first semi-transparent pieces of the hardness of stone; the mass is then decomposed, and finally falls into an impalpable dust, consisting of crystal fragments, which formed originally an exceedingly fine network. The inequality of expansion of the surfaces, brought into tension by the network, is no doubt the cause of this breaking up. But if crystallization is effected in a lower temperature, the net-like crystals are not formed, and no breaking up takes place during the cooling.

The New Eddystone Lighthouse.

Having given a brief description of the old Eddystone lighthouse, erected by Smeaton in 1759, it may not be without interest to give some particulars of the new structure which was finished some time ago. The new tower does not start from comparatively so broad a base as the old one, and is circular in shape, with a gallery all round. It is higher than the old lighthouse, and, admirable as was the dovetailing in the masonry executed by Smeaton, it is said the masonry devised by Mr. Douglass is, compared with Smeaton's, as superior as was Smeaton's to his predecessor's. The stones in the old masonry are dovetailed at the sides with each other, while the stones in the present structure are not only dovetailed at their sides but also at the top and bottom, and, moreover, both in front and back except, of course, upon the internal and external surfaces of the tower. The new tower, up to 25 feet above the level of high water, is absolutely solid, except for the water tanks, the stones being of the best qualities. Many of the individual stones weigh over three tons. The masonry is set in cement. The height of the new tower above high water to the middle of the lantern is 130 feet, and in this elevation there are 10 stories of rooms and chambers, the lowest being the water tank, the second the entrance and hall. Above this are two oil rooms; and going on in order of ascent, the store and coal room, the crane and store room, the living room for the light-house keepers, the low-light room, bedroom and service room for the upper great light. Above this last level is an overhanging parapet, on each side of which there is pendant a 2-ton bell, with striking hammers, to serve for signals in times of fog—that bell being sounded which is on the windward side to warn approaching ships when the light cannot be seen. All the rooms have vaulted ceilings, and in dimensions are 14 feet in diameter, and 9 feet 9 inches in height, except the two lower ones, the entrance hall being 12 feet 9 inches, and the water tank 11 feet 6 inches across. The windows throughout are in gun metal framings; and every provision is made for the safety of the three keepers.

The new lighthouse is furnished with a white double-flashing light, giving two flashes in quick succession every half minute. Each flash is two and a-half seconds in duration, divided by an eclipse of four seconds. The light will be supplied by a Douglass six-wick oil burner, the situation of the rock and the limited space available not permitting the use of electricity, stores of coal and space for the new engines.

In addition to this greater and higher light, there is a smaller and lower catoptric light, consisting of two 21-inch light reflectors, the light being fed by a Douglass three-wick oil burner.

The estimated cost of the new lighthouse was about $390,000, and the actual cost of erection is stated to be well within that estimate.—*Iron Age.*

Protection from Fires.

President Heald, in his address to the National Board of Underwriters, states that investigation of the subject shows that, in the United States, with a population of over fifty million, and a postal system embracing over forty-four thousand cities, towns, and villages, there are less than three thousand places where the property and lives of citizens are protected by either thoroughly or partially equipped fire departments; or, indeed, where any adequate means of exintguishing fires exist.

South American Woods.

As the supply of hard woods for mechanical arts and for decorative purposes declines in this country, it is well to know where to look for the means of replacing it. Brazil seems to offer an inexhaustible supply of hard decorative timber. Within an area of half a square mile, Agassiz counted 117 kinds of wood, many of them admirably fitted by their hardness, tints and beautiful grains for the finest cabinet work. The *muirapinima*, or tortoise-shell wood, undoubtedly the most precious in the world, is found in large quantities on the tributaries of the upper Amazon, where the water can be easily sed as a motive power.

THE GOODWIN GAS STOVE AND METER CO.

1012, 1014 and 1016 FILBERT STREET,

142 CHAMBERS STREET, NEW YORK. PHILADELPHIA. *126 DEARBORN STREET,* CHICAGO.

GAS AS FUEL.

Testimonials showing the Advantages of Gas for Cooking and Heating Purposes,

FROM THOSE WHO HAVE TRIED AND PROVED OUR STOVES AND FOUND THEM "GOOD."

First Prizes have been Awarded us, as follows:

One Gold Medal, Twelve Silver Medals, One Bronze Medal, Five Diplomas.

☞ Gas Companies are advised before deciding finally upon the most meritous Gas Stove in the market to "Prove all things and hold fast to that which is good." We herewith present for their information a few Testimonials:—

OFFICE OF THE NEW ORLEANS GAS LIGHT CO.

NEW ORLEANS, March, 18th, 1880.

THE GOODWIN GAS STOVE AND METER CO.,

DEAR SIR:— . . . . We cheerfully consent to the use of our name as using and recommending the "Sun Dial" *as the most complete and convenient gas stove manufactured in this country,* so far as we have had experience. Yours truly,

THEO. FORSTALL, Gen. Supt.

WALTHAM GAS LIGHT CO.

WALTHAM, MASS., March 6, 1880.

THE GOODWIN GAS STOVE AND METER CO.,

DEAR SIRS:—We had a number of "Sun Dial" Gas Cooking Stoves in use last season among our consumers, and all gave satisfaction.

People were especially pleased with the roasting apparatus and the compact form of the stove.

It was late when we received the first invoice of stoves, so that we did not put out so many as we wished, but expect a rush for the coming "heated term." Yours, very truly,

WM. TARBELL, Supt.

OFFICE OF THE WASHINGTON GAS LIGHT CO.

WASHINGTON, D. C., Feb. 25th, 1880.

THE GOODWIN GAS STOVE AND METER CO.,

DEAR SIRS:—We take pleasure in acknowledging the universal satisfaction your Gas Stoves have given to the parties who purchased them from this company. We had samples of the Gas Stoves of various manufactures, but for economy, use and general satisfaction, we give yours the preference over all others. Assuring you of the pleasure I feel in heartily adding our endorsement to the many you already have, I remain yours very truly,

CHARLES B. BAILEY. Sec'y

OFFICE OF INDIANAPOLIS GAS LIGHT & COKE CO.,

INDIANAPOLIS, IND., Feb. 26th, 1880.

THE GOODWIN GAS STOVE AND METER CO.,

GENTLEMEN:—You are at liberty to add the name of this Company to the list of those who recommend your stoves, as giving entire satisfaction wherever introduced. Yours very truly,

H. WETZEL, Sec'y.

OFFICE OF LANCASTER GAS LIGHT CO.

LANCASTER, PA., May 19th. 1879.

MESSRS. W. W. GOODWIN & CO.,

GENTLEMEN:—Your favor of this date, asking my opinion of the Gas stove, is received. My experience with them has been very satisfactory, both as to the quality of the cooking and the expense.

We have the No. 7 stove constantly in use, doing all our roasting, baking and broiling, and find the cooking is superior to that done on a kitchen range, and with a great deal less trouble, their being no coal, ashes or wood to carry, nor is the expense as great.

The No. 9 stove, with boiler attachment, is doing very well. The lady who is using it informs me she is so much pleased with it that she would not do without it. Yours Respectfully,

J. H. BAUMGARDNER.

THE GAS LIGHT COMPANY OF SYRACUSE.

SYRACUSE, N. Y., May 19, 1879.

MESSRS. W. W. GOODWIN & CO., PHILA., PA.

GENTLEMEN:—We have in use ten only of your "Sun Dial" Gas Cooking Stoves. We advertised them for summer use, and as we had but a few days of warm weather the sale up to this time has been limited. We have many spoken for as soon as the weather is warmer.

The capacity of the stove is surprising. With a No. 8 stove we cooked for a party of seven, giving them broiled oysters, steak, lamb chops, and baked biscuit, in 45 minutes at a cost for gas of 4½ cents. On another occasion we gave a dinner in courses to twenty men, the bill of fare as follows: Broiled shad, beefsteak, roast quarter of lamb, baked biscuit, and coffee, heating the water for washing the dishes four times, resetting the table three times. All was accomplished in one hour and forty minutes, at an expense for gas of eleven cents. This work was all done on one No. 8 stove. All were enthusiastic over the manner in which the oysters, fish and meats were cooked; none had ever experienced any so tender, juicy, and of such full flavor before. We consider the stove a great success, and most complete in all its parts and arrangements. Respectfully yours, &c.,

A. C. WOOD, Supt.

OFFICE OF THE WESTCHESTER GAS CO.

W. W. GOODWIN, & CO., Phila. WEST CHESTER, May 23d, 1879.

GENTLEMEN:—In reply to your inquiry of this date as to my opinion of your Gas Stoves I take pleasure in saying that your stoves are convenient, do their work with facility, and are economical in the use of gas. Miss M. L. Dods cooked five different dishes during one of her lectures in our town, had the gas burning one hour and forty-five minutes, used 60 feet of gas, which at our rate ($3.00 per thousand) would be 18 cents. Using a No. 9 Stove much more work could have been done in this time, as Miss Dods had to explain to her audience how to prepare the dishes, while, at the same time the gas was burning in the stove. Yours truly,

L. G. MCCAULEY, Supt.

THE GOODWIN GAS STOVE AND METER CO., Philadelphia, New York and Chicago.

J. M. WOODSON, Sec'y and Treas., St. Louis.

OFFICE OF THE WASHINGTON GAS CO.

J. C. LORD, Sup't and Engineer.

C. E. GRAY, ESQ., ST. LOUIS, MO. WASHINGTON, IND., April 4, '79.

DEAR SIR:—Enclosed please find weekly statement ending April 12, 1879, and also drawing of a No. 7 Goodwin Stove with an additional plate attached, containing one of the No. 1 Burners, and also one flat iron heater for ironing purposes. This is my idea of giving the parties who intend to use these stoves for cooking purposes increased facilities for boiling or ironing.

The . . . Gas Stove is a failure when it comes to baking, or broiling beefsteak or for general family use. The Goodwin far excels it The . . . stove is a good boiling stove, but you cannot get your oven as hot as with a Goodwin. Besides it is unhandy opening the keys in the position in which they are set, and also sliding the oven on and off, as the case requires. In my test of the two stoves, I find the Goodwin consumes less gas.

My wife commenced cooking a roast of veal on Sunday last, having got breakfast in the usual form, boiling potatoes, baking pies, &c. Dinner being over, water was boiled for dishwashing, and the usual course gone through for supper, baking biscuit, &c. All being completed I read the meter and found 150 cubic feet of gas consumed. This is as near as I could tell on a common gas meter that registers nothing less than 100 feet.

I consider the Goodwin No. 7 Stove with the . . . attachment as shown above to be far the better stove for family use, and will in any case give better satisfaction, it being constructed on a more convenient principle.

Yours respectfully, J. C. LORD.

OFFICE OF THE GAS LIGHT COMPANY OF AUGUSTA.

AUGUSTA, GA., March 1st, 1880.

THE GOODWIN GAS STOVE AND METER CO.

DEAR SIRS:—We very freely give you permission to use our Company's name as using and endorsing your stoves, as we believe them to be a good article, and in the hands of most who know how to economize it is a good thing, and a piece of furniture that should be in every house, as no kitchen is complete without it, and then again, the cheerful, happy face of the mistress of the house, when she awakes in the morning, finds her servants have not made their appearance to get ready the morning meal. "Well, I can hurry to my pet, as it is so clean, can get breakfast ready for my husband and children in a few minutes, as I do not have to wait for the fire to burn up, it is always ready." Why really I have heard parties say, "if I was obliged to sell any of my furniture, I would commence in the parlor first and keep my gas stove to the very last." Yours Very Truly,

GEO. S. HOOKEY, Supt.

OFFICE OF THE CAPE ISLAND GAS LIGHT COMPANY.

CAPE MAY, Feb. 25th, 1880.

THE GOODWIN GAS STOVE AND METER CO.

DEAR SIRS:—We have had your No. 4 and No. 7 Gas Stoves in use the past summer, and can freely endorse their good qualities as perfect and economical cookers. Very Truly Yours,

R. B. SWAIN, Supt.

CAPITAL GAS LIGHT CO.

SACRAMENTO, CAL., March 4th, 1880.

THE GOODWIN GAS STOVE AND METER CO.

GENTLEMEN:—The gas stoves purchased of you last year are now all in operation, and give very general satisfaction. It is somewhat difficult to get people out of their accustomed rut, and like every other good and useful thing, gas stoves must force their way into their deserved place. I am confident it is but a question of time, when they will be used in preference to all others. To show my faith by my works, I have one of the larger, with copper boiler, &c., in use in my house, and find, when the proper pressure of gas is in the pipes, that it cooks in all ways better, quicker and cheaper than with wood or coal in an ordinary stove.

Yours Truly, J. R. WATSON, Pres't.

OFFICE OF CLEVELAND GAS LIGHT AND COKE CO.

CLEVELAND, O., Feb. 28th, 1880.

TO THE GOODWIN GAS STOVE AND METER CO.

GENTLEMEN:—You ask for a word in regard to our experience with the "Sun Dial" Gas Stoves, and in reply would say that they were put on sale here early in the summer of 1879, and many have been sold, and are in use in kitchens, laundries, restaurants, &c., &c. So far as I am informed, whenever introduced, these stoves have given much satisfaction, and there is reason to expect an increased demand for them the present year.

Yours Respectfully, W. H. PRICE, President.

CONSUMERS' MUTUAL GAS LIGHT CO.

BALTIMORE, Feb. 24th, 1880.

THE GOODWIN GAS STOVE AND METER CO.

GENTLEMEN:—The Gas Cooking Stove you sent me I am using in the office of the works at Canton, where several dinners are prepared upon it daily. Its convenience, efficiency and freedom from all smell of gas or smoke, excite the admiration of all who see it, and those who use it are delighted at having hot dinners, with but a few minutes trouble, instead of the usual cold lunch. I can recommend them as a most desirable article for housekeepers. There is no taste of gas whatever about the food cooked in these stoves.

Yours Truly,

F. H. HAMBLETON, Engineer.

OFFICE OF THE GAS LIGHT CO.

WILMINGTON, DEL., Feb. 27, 1880.

THE GOODWIN GAS STOVE AND METER CO., PHILADELPHIA.

GENTLEMEN:—There are many of your "Sun Dial" Gas Stoves in use in this city, and so far have given great satisfaction.

At my home, breakfast can be prepared for ten persons, with a No. 7 Stove, in from twenty to thirty minutes, at an expense of from two to three cents, gas costing at the rate of $1.50 per thousand feet.

Very respectfully yours,

THOS. CURLEY, Supt.

WORCESTER GAS LIGHT CO.

WORCESTER, MASS., Feb'y 25, 1880.

THE GOODWIN GAS STOVE AND METER CO.

GENTLEMEN:—All of your Gas Stoves that we sold last year gave entire satisfaction. Before I sold one I had one put in my own house to take the place of one—well, of another make, and liked it so well that it is there yet. No matter how much fire there may be in the coal range, we do all our broiling, &c., on the gas stove.

I had the next one put in a restaurant on one month's trial; if not satisfactory, to be taken out and no charge for the gas used. The gas was paid for, also the stove, and the stove is there yet.

Respectfully yours, J. H. ROLLINS, Supt.

CINCINNATI HOSPITAL.

CINCINNATI, Dec. 9th, 1879.

MESSRS. W. W. GOODWIN & CO.

DEAR SIRS:—Your favor of the 4th inst. was duly received and contents noted. The Gas Stove answers our purpose so well that the Board of Trustees have decided to accept your proposition of July 11th, 1879, and retain them for the use of the Hospital. Very respectfully, H. M. JONES, Supt.

CINCINNATI, Dec. 9th, 1879.

Second trial of the "Sun Dial" Gas Range commenced at 5 o'clock, A.M. Nov. 17th, 1879, and continued until the work was completed for the day, Saturday, Nov. 22nd, 1879, or for six consecutive days, when the meter was found to have registered 5400 cubic feet. This gives a daily average of 900 cubic feet of gas consumed.

During this time cooking had been done for an average of 375 persons. Such work would have been done on the ordinary coal range.

By accurate weight it has been shown that the coal range, to do this work, consumed daily 4½ bushels of coal of 75 lbs. each, equal to 312 lbs.

Now the average yield of gas per lb. of coal during the year 1878 was 4-37-100 feet, and 4-37-100x312½=1363-44-100 feet of gas. Of this amount 900 feet were daily consumed by the stoves, leaving 463.44.-100 for other purposes, and the coke thus produced.

The matron, under whose supervision the test was made, reports very satisfactory results.

On the whole, the results of the trial are very satisfactory, and the Board of Trustees have decided to keep the stoves for use in the Hospital.

Very truly yours, H. M. JONES, Supt.

OFFICE METROPOLITAN GAS LIGHT CO.

Broadway, cor. 46th St.

NEW YORK, Feb. 29th, 1880.

THE GOODWIN GAS STOVE AND METER CO.

DEAR SIRS:—We commenced to sell your gas stoves in October, 1879, and although the season of the year was not propitious for gas cooking, we have succeeded in selling quite a number, and have not had the first complaint about them.

The undersigned has used a No. 8 "Sun Dial" for over a year in his house, and in summer for five days in the week gas was the only fuel used. Not having used a separate meter for the stove, I cannot give the exact cost of running it, but it was very small. For the convenience and comfort derived I would not be without it.

Yours respectfully, O. F. ZOLLIKOFFER, Sec'y.

THE GOODWIN GAS STOVE AND METER CO., Philadelphia, New York and Chicago.

THE LAFAYETTE GAS LIGHT CO.

LAFAYETTE, IND., March 1st, 1880.

THE GOODWIN GAS STOVE AND METER CO.

GENTLEMEN:—You may use the name of the Lafayette Gas Light Co. as endorsing your stoves. We have not had enough experience with them as yet to enable us to say much, but as far as it goes we are convinced that it is the stove of the future. You may look for an order from us before long.

Yours very truly, E. GROENENDYKE, Sec'y.

OFFICE MUTUAL GAS LIGHT CO.

C. H. NASH, Pres't.
W. A. HASTINGS, Treas.
A. W. NASH, Sec'y.
K. M. MITCHELL, Supt.

ST. JOSEPH, MO., Feb. 28, 1880.

THE COODWIN GAS STOVE AND METER CO.

GENTLEMEN:—Your favor of 23d inst. at hand and contents have attention. You have permission to use this company's name as one using and endorsing your gas stoves, and I take this opportunity to state that they have given entire satisfaction and will be used generally in this city the coming season. Yours truly, C. H. NASH, Pres't.

OFFICE OF THE GAS LIGHT CO. OF THE CITY OF NEW BRUNSWICK.

NEW BRUNSWICK, N. J., Feb. 25, 1880.

TO THE GOODWIN GAS STOVE AND METER CO.

GENTLEMEN:—I have had one of your No. 8 "Sun Dial" Gas Cooking Stoves in use at my own house for the last ten (10) months, and have found it to operate with entire satisfaction, doing all the cooking for a family of eight.

Very respectfully, JNO. W. NEWELL, Sec'y.

NEW HAVEN GAS WORKS.

NEW HAVEN, TENN., Feb. 26, 1880.

THE GOODWIN GAS STOVE AND METER CO.

GENTLEMEN:—Your favor of 23d inst. asking permission to use our name as endorsing the good qualities of your Gas Stoves, at hand. You are at liberty to do so.

Very respectfully, F. C. SHERMAN, Supt.

GEO. M. PULLMAN, President. HORACE PORTER, Vice-President.

PULLMAN'S PALACE CAR COMPANY'S
——GAS WORKS.——

DUANE DOTY, Agent.

PULLMAN, ILL., March 24, 1882.

THE GOODWIN GAS STOVE AND METER CO.

GENTLEMEN:—We have in use among our gas consumers here, and in the company's shops a number of both your heating and cooking stoves, and they are giving good satisfaction. We have in use about thirty cooking stoves of various sizes up to the No. 8 A., and our consumers have never once complained to me about them, but, on the contrary, praise them, and praise the cooking done by them. I most heartily endorse them.

I am sir, yours very respectfully,
GEO. B. BURNS.
Supt. Gas Works.

HOTEL FLORENCE.

I. D. CRAWFORD, Superintendent.

PULLMAN, ILL., March, 24, 1882.

THE GOODWIN GAS STOVE AND METER CO,

GENTLEMEN:—The Gas Cooking Apparatus furnished by you for the "Hotel Florence" consisting of Gas Cooking Range, Bake Ovens, Hot Closets, Hot Plates, &c., have been in use and active operation since Nov. 2nd, 1881, and are giving perfect satisfaction, as we have no other means of cooking or baking anything whatever, we have had ample opportunity to test it thoroughly, and the results are very satisfactory. Our cooking and baking is praised by all who have eaten of it as being of the very best, for good cooking, for convenience and cleanliness it has no equal.

Yours, very respectfully,
I. D. CRAWFORD,
Supt. Hotel Florence for P. P. Car Co.

The above hotel is owned by the Pullman Parlor Car Co. located at Pullman, Ill., about twelve miles from Chicago, and is a first class Hotel in every particular.

The apparatus used in the Hotel Florence consists of one set of Ranges 17 feet long for boiling, roasting and baking; Carving Table and Hot Closets, 12 feet long; Bake Ovens, 8 feet long; also Hot Plates, for coffee, tea, water, boiling eggs, etc., etc.

H. M. KINSLEY, Fine Caterer,

CHICAGO, Feb. 24, 1881,

THE GOODWIN GAS STOVE AND METER CO.

DEAR SIRS:—It is always a pleasure for me to indorse that which I believe to be undoubtedly good, and in compliance with your request for my opinion, cheerfully say, that five months of continuous testing, has convinced me that your stoves will accomplish more work with the same cost of fuel, than any coal or wood stove in existence. No fuel to be carried; no ashes to be taken out, and no raking down of the fire, but a steady, uniform heat, always at a moment's notice ready,—with no waste of fuel when not actually needed—are some of the advantages of your stove. As an adjunct to the cooking apparatus for a restaurant, where dishes are required to be served promptly, your stove is invaluable. It makes a useful, pleasant and pretty piece of furniture, and should certainly act as a stimulus to induce ladies to spend more time in their kitchen.

Very truly yours, H. M. KINSLEY,
66 Washington Street.

PHILADELPHIA, July 15th, 1881.

THE GOODWIN GAS STOVE AND METER CO.

GENTLEMEN:—Under date of December 27th, 1879, I gave you a letter commending your No. 12 "Sun Dial" Gas Cooking Range, and have now to say after nearly two years constant use in my restaurant,, where its capacity is fully tested, you being aware that I am located in one of the busiest spots in town, S. E. corner 4th and Chestnut Streets, and feeding a number of people that I endorse to-day what I wrote then.

The range does its work in my dining-room, and one not acquainted with the place would hardly know that their chops, etc. were cooked within sight; and as regards consumption, I think it has not cost me any more for the gas used than for coal, with all the advantages in favor of gas.

I can serve a chop or steak in from seven to ten minutes, cooked to suit the taste of every one, and thus have no grumbling on account of delays so frequent in restaurants.

I reiterate again that I cannot praise my "Sun Dial" enough, as it will do more than you claim for it, and I can highly recommend it as the best adapted Gas Cooking Range for hotel and restaurant purposes in the country. I extend to all interested a hearty invitation to call and see it in operation.

As ever, yours truly, J. T. HARKER.

PROTHONOTARY'S OFFICE, COURTS OF COMMON PLEAS.

THE GOODWIN GAS STOVE AND METER CO.

GENTLEMEN:—In reply to your letter, would say we have used the Gas Stove purchased of you continuously during the past year, and find it very satisfactory rndeed. We use it for cooking, baking, roasting, washing purposes, etc., and find it answers for many other purposes.

Yours, very respectfully,
THOMAS ASHTON,
1629 Poplar Street.

OFFICE OF STRAWBRIDGE & CLOTHIER,
Eighth and Market Streets,

PHILADELPHIA 3d mo. 31st, 1882.

THE GOODWIN GAS STOVE AND METER CO.

GENTS:—On my return after an absence of several weeks, I find your favor of March 15 awaiting me. It affords me pleasure to say that your Gas Stoves give entire satisfaction.

Yours, etc.,
J. C. STRAWBRIDGE,
Eighth and Market Streets.

PHILADELPHIA April 3, 1882.

THE GOODWIN GAS STOVE AND METER CO.

DEAR SIRS:—Have had one of your "Sun Dial" Gas Stoves in use for two years, and find it invaluable; doing away with the heat and dust of the ordinary range. For roasting and baking it has no equal; and, properly managed, is as economical as the coal-burning range.

Respectfully yours, CHARLES T. REED,
335 Washington Ave.

PHILADELPHIA, MARCH 27, 1882.

THE GOODWIN GAS STOVE AND METER CO.,

The "Sun Dial" Gas Stove purchased of you about a year ago, has been and is in daily use, and gives perfect satisfaction. Is economical and exceedingly convenient, being always ready for use without waiting for the fire to burn up, as with coal, besides being free from the dirt and dust of solid fuel.

Yours &c., T. H. LUDERS,
2119 Bainbridge Street.

THE GOODWIN GAS STOVE AND METER CO., Philadelphia, New York and Chicago.

PHILADELPHIA, Dec. 27th, 1869.

MESSRS W. W. GOODWIN & CO.,

DEAR SIRS:—I bought one of your No. 12 "Sun Dial" Gas Cooking Stoves last September, for use in my restaurant, and have used it ever since for baking, broiling and stewing.

I can say for it that it is always ready and does its work rapidly, that there is no dust nor dirt, no surplus heat, as we are using only that portion that we need, and as soon as the article is cooked the gas is extinguished and there is no waste. I think it will do the same amount of work at less cost than coal, even at the high price of gas. It takes much less room than a coal range that would do the same work. I am perfectly satisfied with it and would not be without it for double the price. If any one wants to see one in operation, send to my place at any time and I will be pleased to give any required information. I want a smaller one in the spring for use at home.

Yours truly J. T. HARKER,

S. E. Corner Fourth and Chestnut Streets.

CLEVELAND, TUSCARAWAS VALLEY & WHEELING RAILWAY CO.
Office, Case Building.

CLEVELAND, O., August 8, 1879.

TO THE GOODWIN GAS STOVE AND METER CO.

DEAR SIRS:—Some weeks ago, when I bought of you the "Sun Dial" Gas Cooking Stove No. 7, I was of the opinion that your recommend *was far too strong*. I desire now to acknowledge that the stove, in the hands of a good cook, is fully up to all you claim for it. And I would especially recommend it, for *nicely* roasting or broiling—*good* beef. I cannot charge you with overstating its qualities in any point. We should be very unwilling to do without it. Yours truly,

W. S. STREATOR.

CITIZENS' SAVINGS AND LOAN ASSOCIATION.

THE GOODWIN GAS STOVE AND METER CO.

I have had in my house one of your "Sun Dial" Gas Cooking Stoves. It has given entire satisfaction, doing all you claimed for it; been using it since June 12.

J. H. WADE.

CLEVELAND, August 5, 1879.

THE GOODWIN GAS STOVE AND METER CO.

Having used one of your No. 7 "Sun Dial" Gas Cooking Stoves since June 23d, I can cheerfully recommend it to any one wanting to have their house comfortable after cooking; doing the ironing and cooking satisfactorily, and doing all that you claimed it would do.

C. D. FOOTE.

ATLANTIC AND GREAT WESTERN R. R.
J. H. DEVEREUX, Receiver.
M. L. FOUTT, Ticket Agent.

CLEVELAND, O., August 9th, 1879.

THE GOODWIN GAS STOVE AND METER CO.

DEAR SIRS:—We have used one of your No. 7 "Sun Dial" Gas Stoves for past two months, have thoroughly tested its various qualities, and are satisfied that it will perform even more, and do better work than you claim for it; as a broiler and roaster there is nothing its equal. Would not part with it for many times its cost, if it could not be replaced.

Very truly,

M. L. FOUTT.

THE FOLLOWING TABLE OF COMPARISON BETWEEN COST OF COOKING BY COAL AND GAS IS THE RESULT OF ACTUAL TESTS MADE BY US.

RECORD OF PEERLESS COAL RANGE, No. 8.

ARTICLE.	How Cooked	Weight Before Cooking	Weight After Cooking	Loss per cent.	Time
Blue Fish	Baked	3 lbs.	2 lbs. 1 oz.	32	31 m.
Rib of Beef	Roasted	9 lbs. 7 oz.	6 lbs. 8 oz.	32	1 h. 37 m.
Chicken	Roasted	3 lbs.	2 lbs. 2 oz.	30	1 h. 6 m.
Beef Steak	Broiled	1 lb. 2 oz.	13¼ oz.	25	11m.
Lamb Chops	Broiled	1 lb. 1 oz.	11 oz.	35	12m.
Sweet Potatoes	Steamed	3 lbs. 5 oz.			
White Potatoes	Steamed	3 lbs. 8 oz			
Cauliflower	Boiled	2 lbs. 12 oz.			
Tomatoes	Stewed	4 lbs.			
Bread	Baked		5 lbs. 2 oz.		46 m.
Sago Pudding	Baked		3 lbs. 5 oz.		27 m.
Lemon Pie	Baked		2 lbs. 12 oz.		30 m.

Sauces for fish, beef and cauliflower.

Total time from lighting of fire until everything was ready to serve, 2 hours and 40 minutes. Of this time 30 minutes was required to heat the oven, leaving 2 hours and 10 minutes actual cooking time. Weight of coal including lighting of fire, 44 lbs. At the end of the time the fire was ready for more coal. Cost of coal, 44 lbs., @ $5.50 per ton, 10.95 cents. Kindling 1 cent. Total 11.95 cents.

RECORD OF No. 7 GAS STOVE.

How Cooked.	Weight Before Cooking	Weight After Cooking	Loss per cent.	Time
Baked	3 lbs.	2 lbs. 6 oz.	20	35 m.
Roasted	9 lbs. 4 oz.	7 lbs. 11 oz.	17	1 h. 25 m.
Roasted	3 lbs. 1 oz.	2 lbs. 10 oz.	14	1 h.
Broiled	1 lb 2 oz.	15 oz.	16⅔	8 m.
Broiled	1 lb.	13¼ oz.	15	10 m.
Steamed	3 lbs. 5 oz.			
Steamed	3 lbs. 8 oz.			
Stewed	4 lbs.			
Boiled	3 lbs. 12 oz.			
Baked		5 lbs. 7 oz.		37 m.
Baked		3 lbs. 3 oz.		28 m.
Baked		2 lbs. 14 oz.		22 m.

Sauces, etc.

Total time from lighting of gas until everything was ready to serve, 1 hour and 50 minutes. Consumption of gas by test meter 38 feet, cost 8.17 cts.

Cost of Coal ..... 11.95 cents.
" Gas ..... 8.17 "

Saving over Coal ..... 3.78=46 per cent.

TABLE OF COMPARISON OF PERCENTAGES IN LOSS AFTER COOKING.

GAS STOVE. FISH.		RANGE. FISH.	
Cost	35 cents.	Cost	35 cents.
Product	28¼ "	Product	24½ "
Loss	6¼ "	Loss	10½ "

Saving of gas stove over range, 3¼ cents.

GAS STOVE. BEEF.		RANGE. BEEF.	
Cost	166¼ cents.	Cost	169⅞ cents.
Product	138⅜ "	Product	117 "
Loss	28⅛ "	Loss	52⅞ "

Saving of gas stove over range, 24⅞ cents.

GAS STOVE. CHICKEN.		RANGE. CHICKEN.	
Cost	61½ cents.	Cost	60 cents.
Product	52⅛ "	Product	42½ "
Loss	8⅜ "	Loss	17½ "

Saving of gas stove over range, 8⅜ cents.

GAS STOVE. STEAK.		RANGE. STEAK.	
Cost	24⅝ cents.	Cost	24⅝ cents.
Product	20⅛ "	Product	$18\frac{9}{16}$ "
Loss	4½ "	Loss	$6\frac{3}{16}$ "

Saving of gas stove over range, $2\frac{1}{16}$ cents.

GAS STOVE. CHOPS.		RANGE. CHOPS.	
Cost	20 cents.	Cost	21½ cents.
Product	16⅔ "	Product	13⅜ "
Loss	3⅓ "	Loss	7⅛ "

Saving of gas stove over range, 4⅛ cents.

The total saving in the cost of food cooked over Coal Range ..... $43\frac{1}{16}$ cts.

Saving in cost of gas over coal (cost of coal over gas, 46 per cent.) $3\frac{78}{100}$ "

Total saving ..... $47\frac{88}{100}$ "

THE AMERICAN
GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

Editor—G. WARREN DRESSER.
Manager—C. E. SANDERSON.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH
At No. 42 Pine Street, New York.

This is a recognized official organ of—
LIGHT, HEAT, STEAM, WATER-SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE.

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BOSTON—S. M. PETTENGILL & Co., 6 State Street.
PHILADELPHIA—PRATT & Co., Corner 9th and Arch Streets.
England—C. W. HASTINGS, 22 Buckingham St., London, W. C.
Germany—B. WESTERMANN & Co., of New York

MONDAY, JULY 3, 1882.

Gas-Fired Baker's Ovens and Gas Pottery Kilns.

Several members of the Gas Institute, after their meeting at the Crystal Palace, visited South Kensington, where the gas-fired baker's oven and gas pottery kiln have been kept in operation for a series of tests. Lately a large deputation of the Master Bakers' Association paid a second visit, and took part in trials of bread baking, which were considered satisfactory. Messrs. Huntley and Palmer were represented at the trials by Mr. Alfred Palmer.—*Review of Gas and Water Engineering.*

The Manufacture of Dynamite.

At the fifth annual reunion of the workpeople employed by Nobel's Explosives Company, held lately, the chairman, Mr. G. M'Roberts said that in 1867 there were only 11 tons of dynamite manufactured throughout the world, and this production had risen gradually till in 1875 it reached 4,000 tons. In their own factory at Ardeer the quantity produced had risen from 458 tons in 1876 to 973 tons in 1881, and was still increasing, while the demand for blasting glycerine was greater than they could supply.—*Ironmonger.*

Electricity and Fire Insurance.

Engineering says that the directors of the Crystal Palace Company, as well as their numerous tenants, stall-holders, and exhibitors, have within the last few days been served with notices issued conjointly by the various insurance companies in whose offices the Crystal Palace and its contents are insured, to the effect that, in consequence of the establishment within the building of the Electrical Exhibition, the premiums on the policies of insurance against loss by damage by fire during the next six months will be more than doubled. The Crystal Palace and its contents have for many years been charged for insurance at an excessively high rate (31s. 6d. per cent.), considering the nature of the building and the fact that it could never be totally destroyed by accidental fire, and this rate is now to be increased by 21s. per cent., for six months, making the total charge at the rate of £3 13s. 6d. per cent. per annum. The extra premium to the Crystal Palace Company for the building alone represents a sum of £2,000, or 40,000 visitors on shilling days.—*Review of Gas and Water Engineering.*

Gas Exhibition at Bristol, England.

The Bristol United Gas Light Company intend, on September 25 next, to open at the Drill Hall, Bristol, an exhibition of gas engines, stoves, fires, burners, fittings, and appliances for cooking, heating, and other purposes for which gas may be used. It is intended to invite the co-operation of makers of every kind of gas apparatus.

Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.
(with W B Scott & Co.,)
34 PINE STREET, NEW YORK CITY.
JULY 3, 1882.

☞ All communciations will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid.	Asked
Gas Co.'s of N. Y. City.				
Central	$466,000	50	70	75
Harlem	1,800,000	50	94	96
" Bonds	170,000			103
Manhattan	4,000,000	50	212	215
Metropolitan	2,500,000	100	175	180
" Bonds	658,000	..	107	110
Mutual	5,000,000	100	92	94
" Bonds, go'd.	900,000	1000	100	104
Municipal	1,500,000	100	175	180
" Bonds	750,000		106	110
New York	4,000,000	100	115	118
Northern	270,000	50	—	100
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	100	103
Citizens	1,200,000	20	65	70
" S. F. Bonds.	320,000	1000	105	107
Fulton Municipal	3,600,000	100	84	88
Peoples	1,000,000	10	45	—
" Bonds	290,000	.	104	107
" "	250,000	...	78	90
Metropolitan	1,000,000	100	62	65
Nassau	1,000,000	25	50	55
" Ctfs.	700,000	1000	93	96
Williamsburgh	1,000,000	50	57	60
" Bonds	1,000,000	...	100	101
Richmond Co., S. I.	300,000	50	70	75
" Bonds	40,000	—	—	—
Out of Town Gas Companies.				
Buffalo Mutual, N.Y	750,000	100	—	75
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	—	—
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			125	—
Cincinnati G. & C. Co.			178	180
Consolidated, Balt.			38	39
Bonds			107	—
East Boston, Mass	220,000	25	122	128
Hannibal, Mo	100,000	100	95	100
Hartford, Conn	700,000	25	140	144
Halifax N. S	400,000	40	148	150
Hamilton, Ontario	155,000	40	117½	
Jersey City	750,000	20	155	160
Jacksonville, Ill	120,000	50	100	...
Lewistown Maine	400,000	100	—	100
Laclede St Louis Mo.	1,200,000	100	112	117
Montreal, Canada	2,000,000	100	168	170
New Haven, Conn		25	132	—
Oakland, Cal			32	33
Peoples, Jersey City		...	75	80
" " Bds,			...	...
Pittsfield, Mass			120	130
Rochester. N. Y		50	70	80
Wilmington, Del		50	174	...
Yonkers		50	30	32
St. Louis Missouri	600,000	50	250	254
San Francisco Gas-Co., S. Fr'isco Cal.			68	69
Toledo, Ohio			95	97
Troy, Citizens	600,000	100	—	—
Washington, D. C	1,500,000	20	185	200
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The following shares were sold at auction: 266, New York, at 115; 120 Manhattan, at 212½; 25 Metropolitan, at 175.

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AS SUPERINTENDENT OF GAS WORKS.

Has had 25 years' experience. The best of references. Address "A. G.," care this Office.

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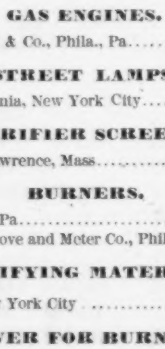

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Are adapted for use of Streets, Parks, Depots, Ferries, & Private Grounds.

WITH POSTS OR BRACKETS.

Jacob G. Miner,

MORRISANIA, N. Y. CITY.

The Pelouze & Audouin Condenser

I would request that gas-makers ordering or making inquiries about this machine would inclose a working tracing of their apparatus from hydraulic main to center seal.

JAS. R. SMEDBERG, 35 Broadway, N. Y.

The "Standard" Washer-Scrubber

KIRKHAM, HULETT & CHANDLER PATENT.

Removes **all the Ammonia** and a large percentage of **Sulph. Hydrogen and Carb. Acid.**

GAS WORKS, PLACE D'ORLEANS, QUEBEC, March 10, 1882.

GEO. SHEPARD PAGE, ESQ., New York:—I inclose you copies of the Government Inspector's test and certificate, showing that the washer is working well and taking out every particle of ammonia. D. H. GEGGIE, Secretary and Manager.

"GAS INSPECTOR'S OFFICE, QUEBEC, March 7, 1882.

"I hereby certify that at the request of the Quebec Gas Company I have tested the purity of the gas furnished by the said Company, and after testing such gas in accordance with the provisions of the act to provide for the inspection of gas, I find the quantity of ammonia contained therein is 0.00 in 100 cubic feet thereof. N. LEVASSEUR, Inspector."

NEWPORT GAS LIGHT CO., NEWPORT, R. I., March 12, 1882.

GEO. SHEPARD PAGE, ESQ.:—I have many letters inquiring about my experience with the "Standard" Washer-Scrubber, and I give only the plain facts of its behavior with us, which is in every respect so creditable to the machine that I can always give it a first-class character to those seeking its help. WILLIAM A. STEDMAN.

The following American Gas Companies have adopted the "Standard" Washer-Scrubber:

Allegheny, Penn.	Consolidated, Baltimore.	Citizens, Newark, N. J.	Williamsburgh, N. Y.
Metropolitan, N. Y.	Newport, R. I.	Havana, Cuba.	Quebec, Canada.
Richmond, Ind.	Rockford, Ill.	St. Joseph, Mo.	

The concentrated ammoniacal liquor produced has an immediate sale at prices much above what has heretofore been offered.

GEO. SHEPARD PAGE, 49 WALL STREET, N. Y.,

SOLE AGENT FOR THE WESTERN HEMISPHERE.

CIRCULAR TO GAS LIGHT COMPANIES.

BRANCH OFFICE OF THE STRONG GAS FUEL AND LIGHT COMPANY,
CORNER BROADWAY AND MAIN STREET, YONKERS, July 2, 1881.

The YONKERS FUEL GAS COMPANY is now in successful operation, manufacturing Water Gas by the STRONG PROCESS, for HEAT, POWER, and LIGHT.

It has about two and a half miles of mains already in use through the heart of the city of Yonkers, and is supplying gas for cooking, heating, and various industrial purposes.

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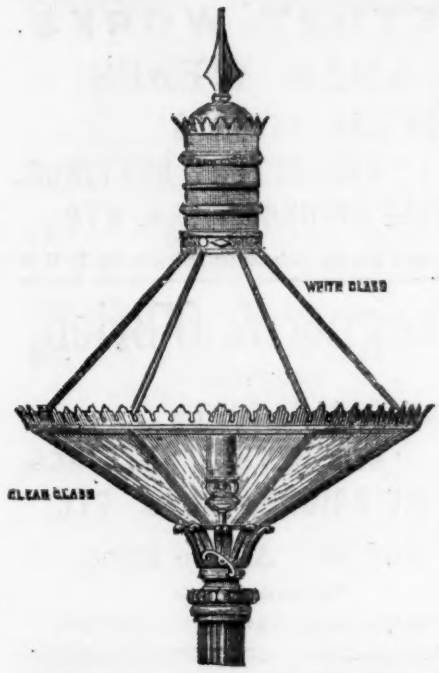

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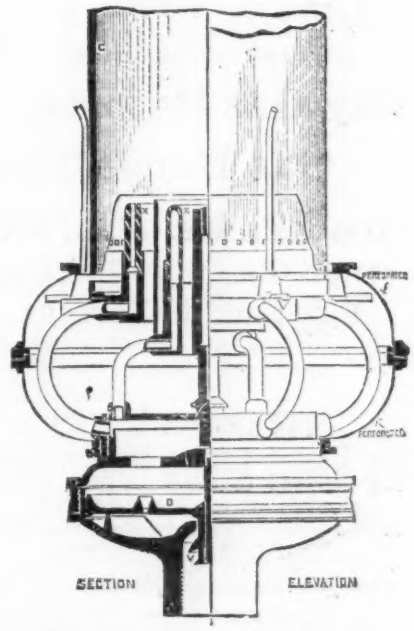

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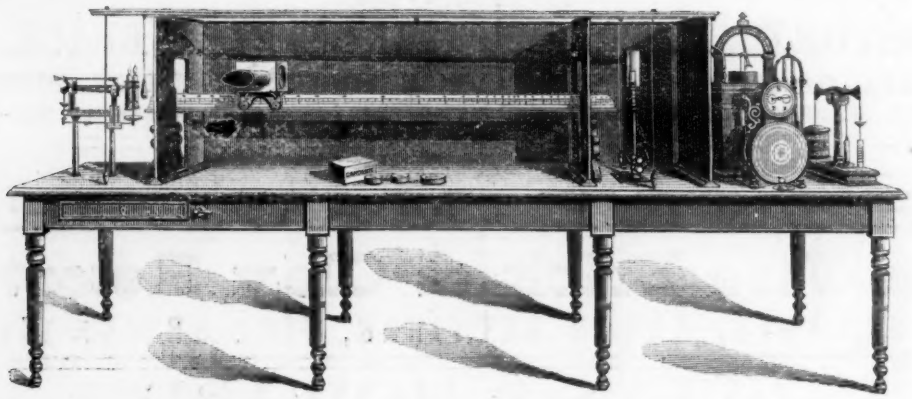

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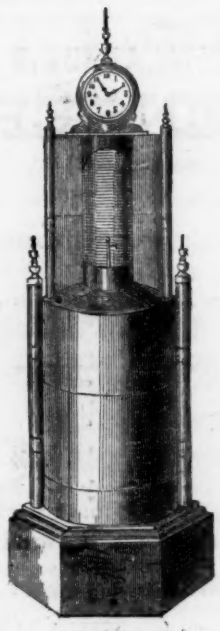

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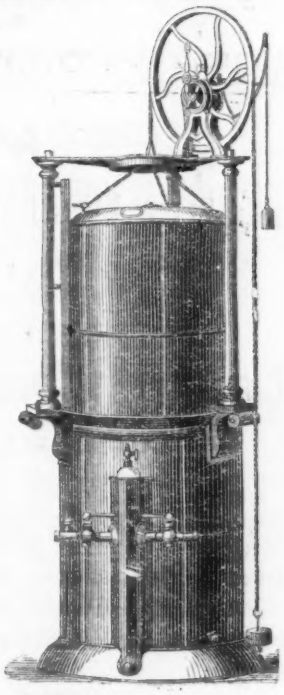

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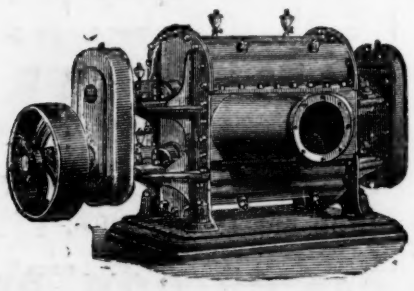

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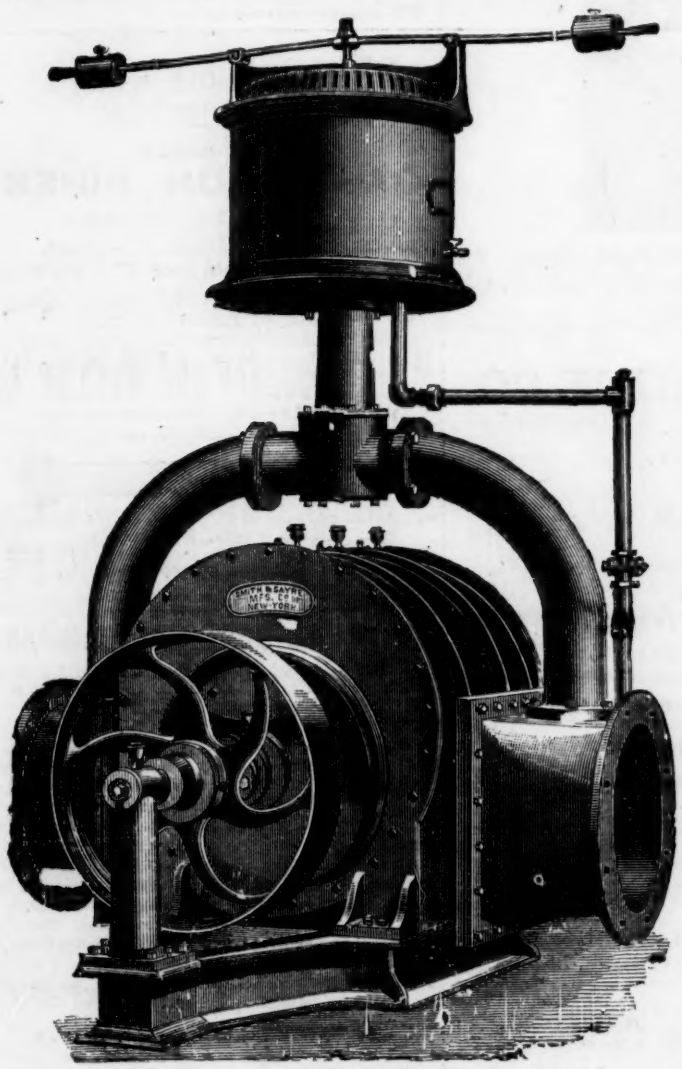

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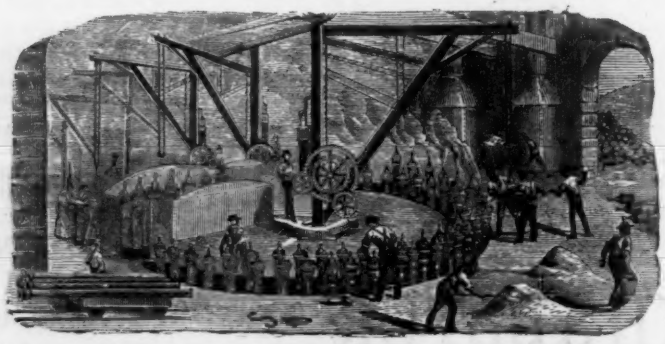

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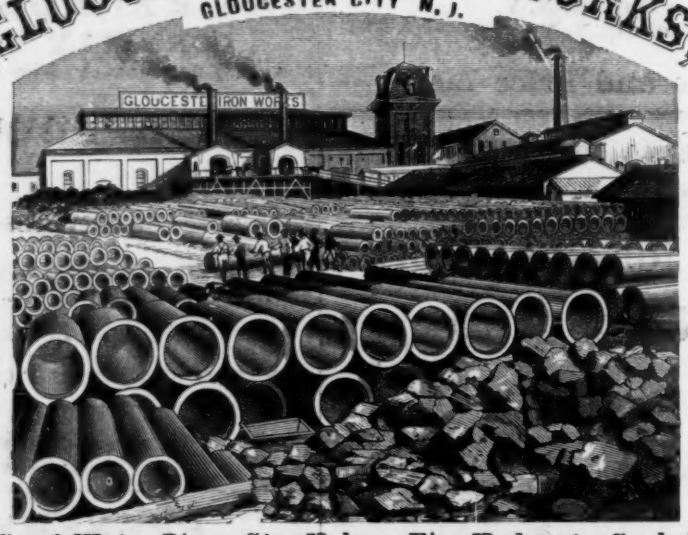

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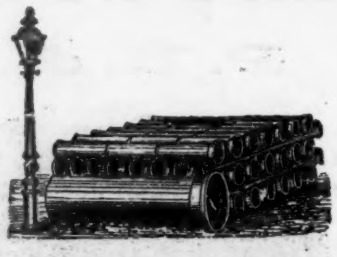

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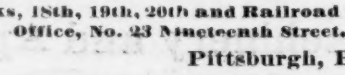

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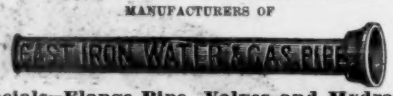

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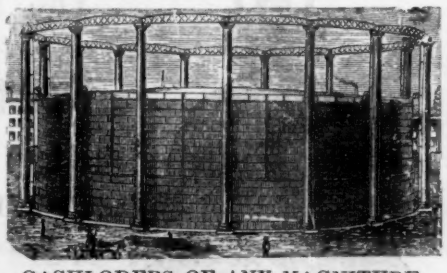

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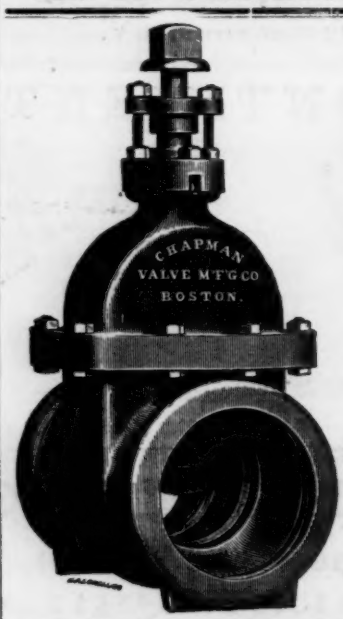

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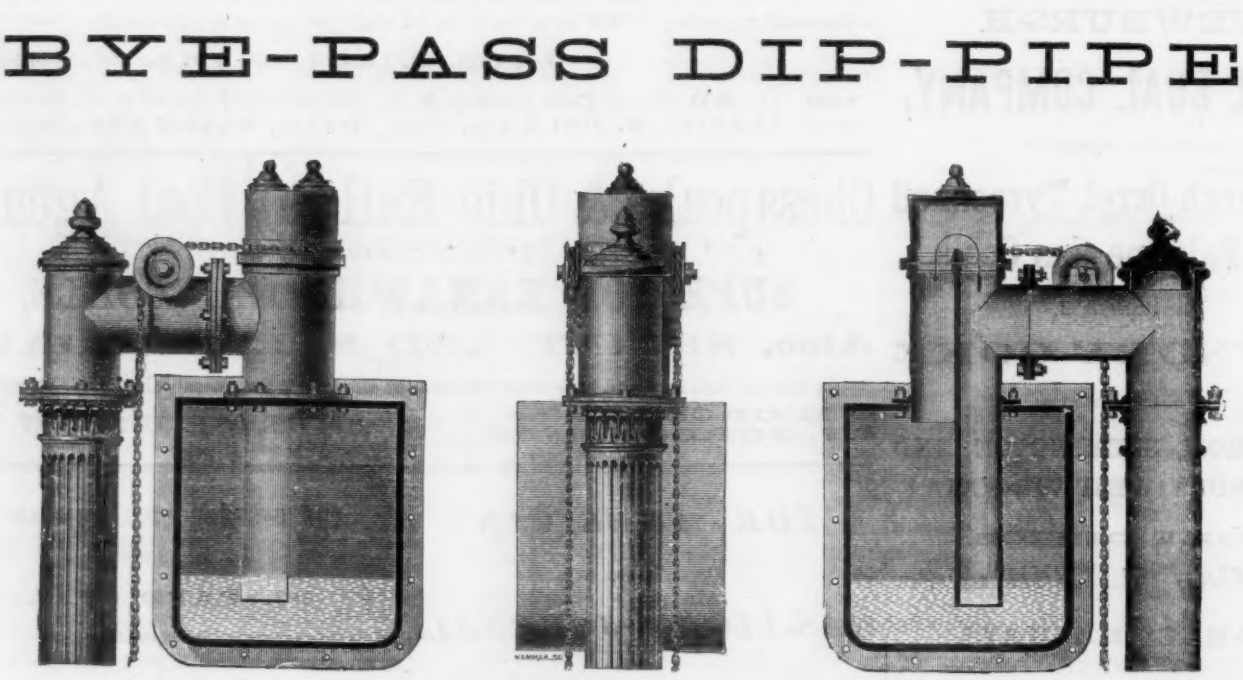

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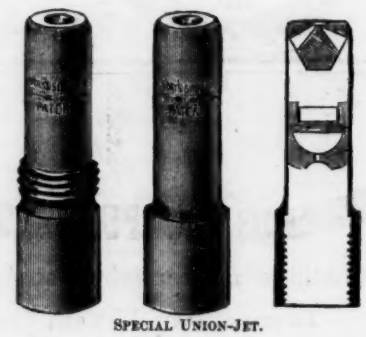

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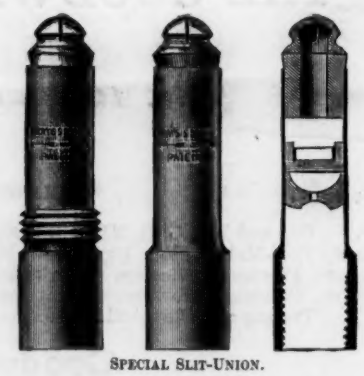

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